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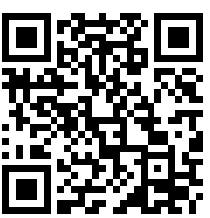

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THE

RAILWAY MAGAZINE

VOL. XLI.

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THE RAILWAY MAGAZINE.

GREAT NORTHERN RAILWAY 2-6-0 Express Goods Engine, No. 1636.

Fitted with Superheater and Wakefield's Patent No. 7 Mechanical Lubricator and Patent Anti-Carboniser.

Cylinders: 20 in. diameter by 26 in. stroke. Driving Wheels: 5 ft. 8 in. diameter.

Heating Surface: Tubes, 981 sq. ft.; Firebox, 137 sq. ft.; Superheater, 303 sq. ft.; Total, 1,421 sq. ft.

Fire-grate Area: 24·5 sq. ft. Working Pressure: 170 lbs. per sq. in.

Wheelbase of Engine: 24 ft. 10 in. Length over Buffers, Engine and Tender: 56 ft. 8 in.

Adhesion weight: 51 tons 14 cwt. Weight in working order: Engine, 61 tons 14 cwt.: Tender, 43 tons 2 cwt.; Total, 104 tons 16 cwt.

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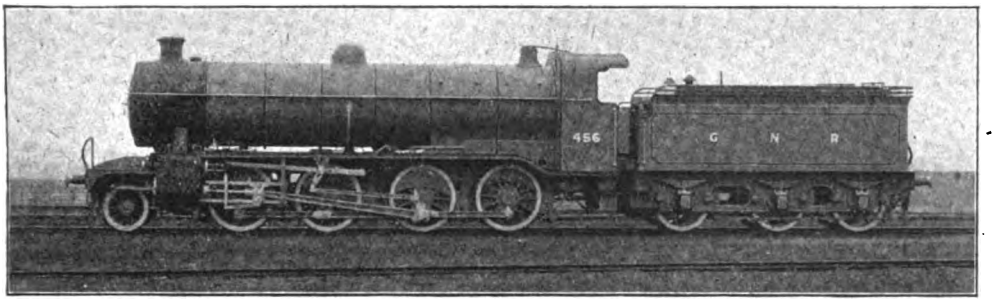

GREAT NORTHERN RAILWAY.
2-8-0 Coal Engine, No. 456.

Railways and the Growth of Industries.

COAL TRAFFIC.

By CHARLES DIX.

PREVIOUS articles under this general heading which have appeared in the RAILWAY MAGAZINE were intended to demonstrate the important part played by the railways in the creation and growth of new industries; and cases of immediate and almost phenomenal development have been cited as examples where insignificant individual and local efforts have, through the beneficent attitude of the railways, resulted in the rapid building up of large industries and prosperous trading communities.

Under a somewhat different category, the subject of the present article, outlining the part played by the Great Northern Railway in the development of the coal industry of the country, indicates the point of view of all the railways in regard to the vital question of coal supply; for although the Great Northern is not primarily regarded as a coal carrying line, the fact remains that it does convey an enormous traffic and was, indeed, the first railway to carry coal to London in any considerable quantities.

One of its avowed objects when the railway was projected in 1841 as the London to York Company was not only to link up London with the great population centres in the northern parts of the kingdom, but to provide facilities for the transmission of coal from South Yorkshire (and incidentally from Nottinghamshire and Derbyshire) to London and the towns along the whole course of its system.

Here, then, is no short story of a spontaneous growth and an equally spontaneous effort on the part of the railway; but rather a long history covering more than half a century of settled policy and prolonged struggle for the development of traffic in an un-got commodity, which now represents the chief source of the nation's power and wealth.

The chief coal development the Great Northern had in view was that of the South Yorkshire coalfield which lies closely adjacent to the northern extremity of the line at Doncaster, and their scheme involved the water transit of truck loads of coal from the coalfield to Doncaster, whence it could be forwarded by rail without a break to London; this, too, at a cheaper rate of carriage than the Midland Railway had seen fit to apply to the coal traffic from the Derbyshire and Leicestershire coalfields, the effect being a very considerable reduction of coal prices in London.

In 1847, notwithstanding every opposition from the Midland, the construction of the South Yorkshire Railway was sanctioned for the 16 miles from Doncaster to Barnsley, being largely financed by the South Yorkshire coalowners, and its Chairman being Lord Wharncliffe, a name of coal fame even in these days. In the same year, too, an amalgamation was sanctioned between the Manchester to Sheffield and Sheffield to Lincoln Railways, which became the Manchester, Sheffield and Lincolnshire Railway, and this railway was to prove a dominating factor in the development of the South Yorkshire coalfield and actually formed one of the chief obstacles to the effective prosecution of the policy of South

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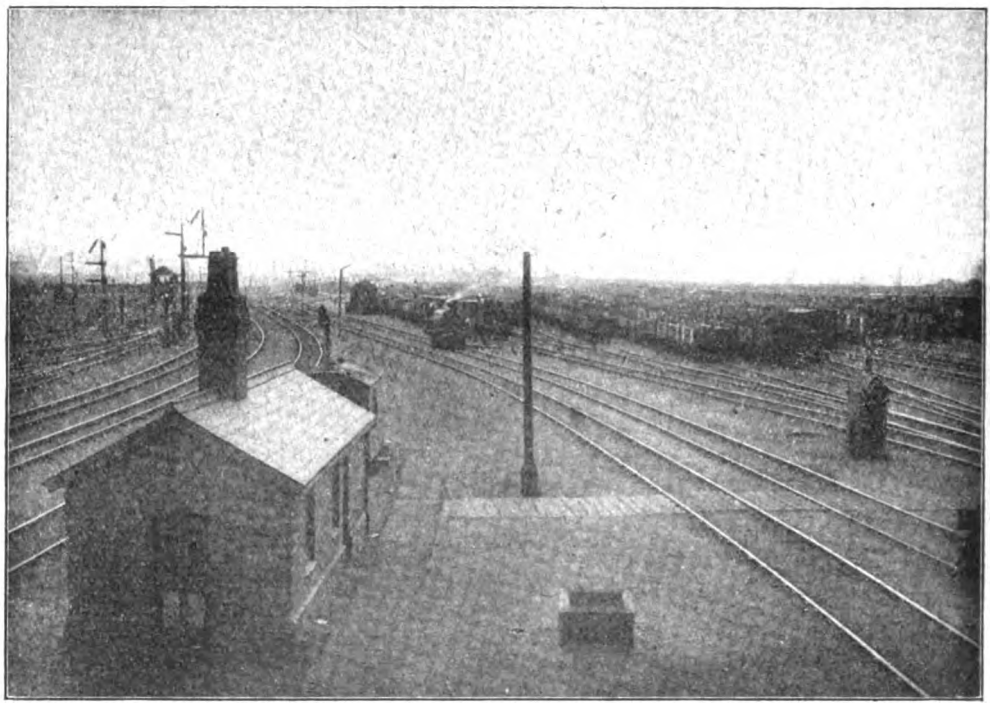
Yorkshire coal for the Great Northern and London.

The first traffic in South Yorkshire coal had found an outlet over the Sheffield and Lincolnshire Railway, and as the Northern and Lincolnshire sections of the Great Northern line neared completion, the latter railway supplied 2,000 additional wagons to further encourage the traffic into Lincolnshire; until finally, in 1851, after innumerable difficulties in arranging the question of division of rates with the South Yorkshire interests, the traffic was eventually extended to London and the transit of coal from South Yorkshire to the Metropolis became an accomplished fact.

Practically the only source of direct supply to the Great Northern system was the South Yorkshire coalfield, and with every effort bent upon its development the traffic soon reached the respectable figure of 200,000 tons, for the conveyance of which the Great Northern supplied engines and wagons and in fact made every endeavour to secure the chief output of the coalfield.

These efforts were, however, greatly handicapped by the attitude of the South Yorkshire Railway, who demanded so heavy a toll over their 16 miles of line as to render it next to impossible for the Great Northern with their long haul from Doncaster to London to compete satisfactorily with the Midland and North Western coal traffic from the Midlands. Moreover, the South Yorkshire colliery owners had done much to hinder the Great Northern development by checking and diverting supplies with a view to increased prices; but finally a more satisfactory understanding was arrived at and the traffic began to flow into King's Cross, where large depôts had been constructed to receive it, and the Great Northern not only became the biggest carriers but, acting as merchants, were also the largest distributors of coal in the Metropolis, to the very distinct benefit, be it added, of the London consumer. Needless to say this consummation was viewed with displeasure by the Midland and North Western interests, who had, so far, only made small provision for a London coal traffic from the Midlands, and naturally



COLWICK YARD, GREAT NORTHERN RAILWAY.

A section of Down Empties Yard, where trains are marshalled and despatched to the collieries. The main lines through the yard are shown to the left of the picture.

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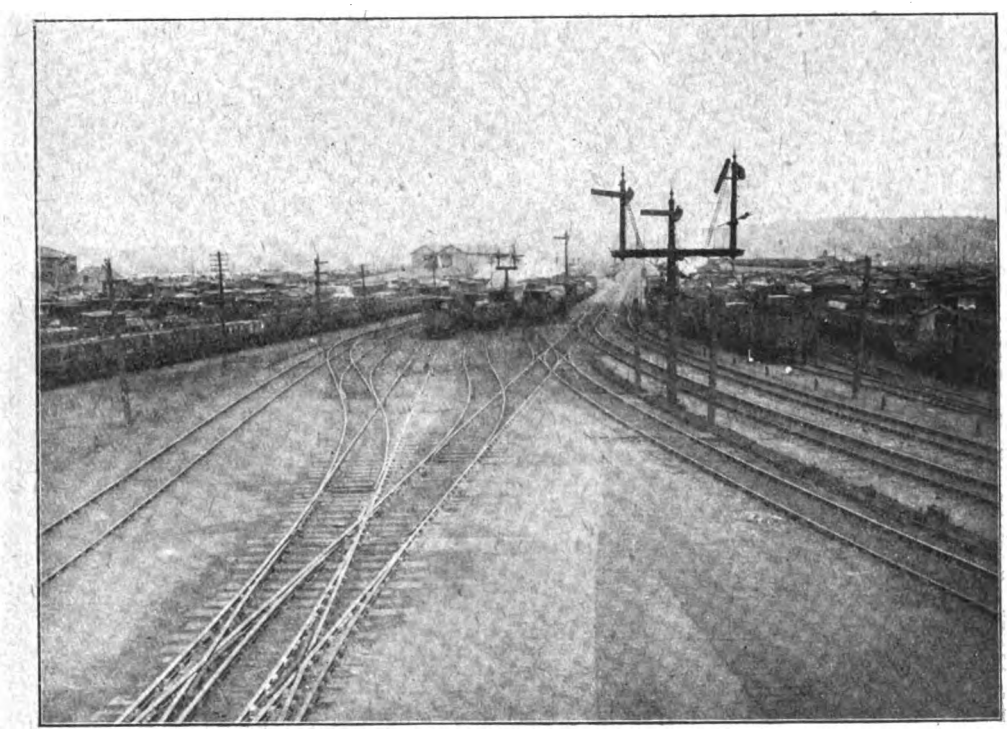
a keen competition ensued between the rival routes.

About this time (1852) the Great Northern began negotiations for amalgamation with the Ambergate, Nottingham, Boston and Eastern Junction Railway, which at that time ran from Grantham to the village of Colwick, a few miles out of Nottingham, into which place they had running powers over the Midland Railway. This line, which is now the main line into the Nottingham or Western District of the Great Northern obtained Parliamentary powers to extend to Nottingham; and so in addition to the South Yorkshire coal traffic, which now amounted to £300,000 a year despite the competition of rival railways and the obstructive policy of the coalowners, the Great Northern forced their way into the Midland coalfields, introducing a healthy element of stimulation which undoubtedly contributed very largely to the development of the huge coal traffic of the present day. Now thoroughly aroused, the combined



COLWICK YARD, GREAT NORTHERN RAILWAY.

Left of the picture shows a section of the Down Goods Yard, and, to the right, a section of the Up Goods and Coal Sorting Siding, the two divided by the main lines.

system, was intended to provide a competitive route from the Nottinghamshire and Derbyshire coalfields, hitherto the monopoly of the Midland Railway, who, opposing the Great Northern project not only gained their point, but also secured an interest in the South Yorkshire line, thus jeopardising the traffic from that district which the Great Northern had been at so much pains to build up.

Two years later, however, the Great Northern secured their amalgamation with the Ambergate Railway, which in turn

Midland and North Western interest, which up to that time had made no serious effort to develop a London coal traffic, attempted to remedy this oversight (not only speeding up the coal traffic from the Midlands, but using their interest in the South Yorkshire Railway to compete with the Great Northern in its own territory) and commenced sending coal from the South Yorkshire coalfields both to Euston and by the Great Eastern *viâ* Peterborough; and when in 1861 the Midland Railway obtained running powers into London the supremacy of the Great

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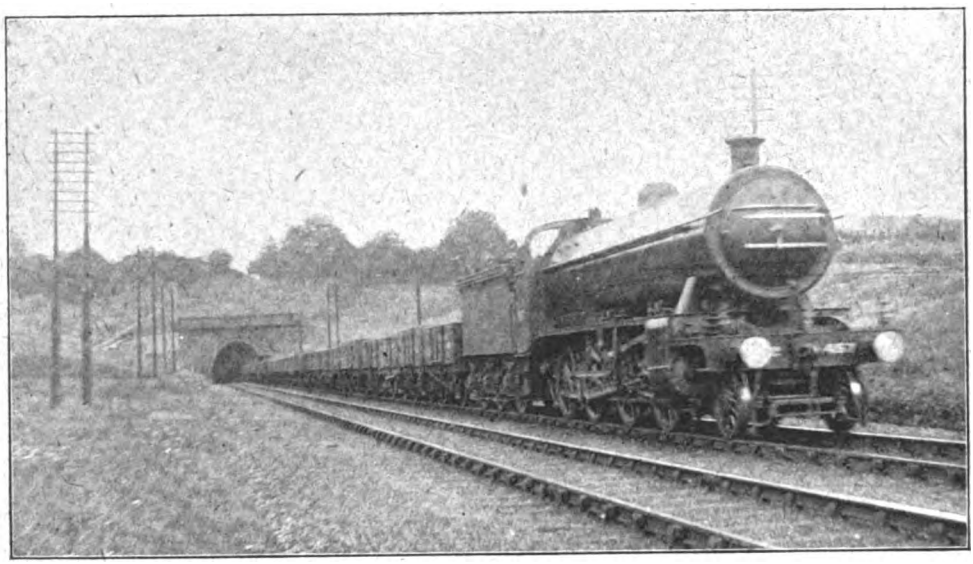
Northern as the largest coal carrying railway into London was seriously threatened.

Although the Great Northern Railway had practically created the South Yorkshire coal traffic its development, as previously intimated, had been retarded by the "grabbing" policy of the collieries and in view of the encroachment of the Midland it was a stroke of enterprise to carry the war into the enemy's camp by securing the Ambergate Railway into the Nottingham District.

In 1862 the Midland decided to extend their line to London and the Great Northern thereupon applied to extend the Ambergate line alongside the Midland Railway through the Erewash Valley into the centre of the Nottinghamshire and Derbyshire coalfields, pleading the inadequacy of the meagre and costly service rendered by the Midland in the transfer of coal traffic to the Great Northern system at Nottingham. The position was further complicated by the purchase of the South Yorkshire line by the Manchester, Sheffield and Lincolnshire Railway, which, although closely associated with the Great Northern in several directions, were also displaying a good deal of antagonism, especially in regard to South Yorkshire coal. For it was the existence of nearer markets on the Manchester, Sheffield and Lincolnshire Railway and that Company's resentment at the intrusion of the Great Northern which largely accounted for the attitude of the coalowners towards the Great Northern development of the South Yorkshire coal traffic to London.

An attempt was made to solve the problem by means of a general agreement under which all the coal rates from Yorkshire, Derbyshire, Nottinghamshire and Leicestershire to London were "equitably adjusted to each other" and the through charges from the various coal centres were "made fair one with the other." But the Midland, now fully realising the immense value of their coal traffic possibilities, persisted in the project to extend their line to London.



Photo] [*W. K. Smith.*

GREAT NORTHERN RAILWAY.

2–8–0 superheater engine on mineral train, near Hadley Wood.

Further difficulty in connection with the South Yorkshire line was how experienced by the Great Northern, the new owners demanding an excessive proportion of the agreed rates to London; and attempts to meet this difficulty in order to retain the South Yorkshire coal traffic led the Great Northern into further conflict with the Midland, who succeeded for the time being in crowding them out of the Nottingham district.

Even under then existing circumstances the traffic from this district already represented an annual value of £20,000 to the Great Northern, but it was not until 1872 that they secured powers to penetrate the

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coal stronghold of the Midland. The extensions then sanctioned carried the Great Northern from Colwick through Bestwood, Bulwell and Kimberley—all new sources of traffic—along the Erewash Valley to Codnor Park and Pinxton, and also to Derby; and finally to Burton over the North Staffordshire Railway from Egginton.

In the first half year of 1876 no less than 115,000 tons of coal had passed over the completed section of the new line from Pinxton to Colwick, but this additional traffic scarcely balanced the falling off in the South Yorkshire traffic, which traffic, owing to the continued opposition and antagonism of railway and colliery owners, the Great Northern had to a great extent been compelled to relinquish much to the detriment of the London coal trade.

No wonder, then, the Great Northern now concentrated their energies upon the development of their new territory in the Midlands and in 1880 further powers were granted to construct the Leen Valley line, 12 miles in length, from Bulwell to Newstead through a coal area which as yet remained untapped; and early in 1881 coal trains were running over this new line with the result that during the first six months the Great Northern coal traffic had increased by a quarter of a million tons from the Nottingham and Derbyshire coalfields alone.

During the early period of the coal development the Great Northern were the sole distributors of South Yorkshire coal in London, Mr. Herbert Clarke, of coal renown, being the sole agent of the Company for this purpose; but latterly, since 1860, the trade has passed into the hands of private merchants, the demand for coal having become so great that a wider and more comprehensive method of distribution became absolutely necessary. In view, too, of the continually increasing demand for coal, an important opening had been secured by the Great Northern in 1866, a junction with the South Eastern and Chatham Railway having been effected by means of a link line from Blackfriars to Farringdon Street and a considerable through coal traffic to the South of the Thames had already materialised. In later years this South of London traffic has grown enormously, additional transit and transfer facilities have been secured and at the present time thousands of tons of coal are conveyed weekly by Great Northern trains through to the South Eastern and Chatham, the London, Brighton and South Coast and London and South Western Railways for distribution over their respective systems. In one week recently over 100 trains with more than 2,000 wagons worked from Ferme Park, the chief London coal collecting centre of the Great Northern, to Herne Hill, Hither Green and Bricklayers' Arms for stations on the South Eastern and Chatham Railway. Similarly, a daily train of 22 wagons worked to Brockley and another to Clapham Road for the South Eastern and Chatham Railway; all by means of the junction at Blackfriars referred to above. In addition to these about 1,700 wagons passed from Ferme Park to Battersea and Tulse Hill for stations on the London, Brighton and South Coast Railway *viâ* Blackfriars Junction and Stewart's Lane and Herne Hill Junctions respectively; whilst 13 trains of over 200 wagons were worked to Barnes *viâ* Blackfriars and Clapham Junctions and a further 19 trains of over 400 wagons *viâ* Kingsland Junction and the North London Railway, all with coal for the London and South Western system.

Ample compensation awaited the Great Northern for the falling-off of the South Yorkshire traffic in the rapid development of the Nottingham and Derbyshire coalfields, and between 1881 and 1890 the total weight of coal hauled by the Company had increased from one million to more than five million tons; whilst the Blue Book for 1913 shows that 8,739,556 tons were conveyed from collieries or places situated on the Great Northern Railway, the receipts amounting to more than a million and a quarter pounds sterling.

This latter figure, however, does not represent the whole of the coal traffic conveyed over the Great Northern system during the year mentioned. The gross total tonnage was 14,197,254 tons, the balance having emanated from districts on other railways, such as the Durham and Northumberland coalfields on the North Eastern system; and these figures provide, perhaps, the best illustration of the enormous development of the Great Northern coal traffic since their entry into the Nottingham and Derbyshire coalfields.

The decline of the South Yorkshire traffic, upon which the original coal scheme of the Great Northern Railway was based, has in recent years been followed by a more extensive development in an adjoining district, and a new South Yorkshire coalfield has been evolved. Moreover, a new South Yorkshire Railway constructed roughly speaking between Doncaster and Shireoaks,

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a station on the Great Central between Worksop and Sheffield, already conveys a very considerable traffic from this new source of supply, which has indeed proved so productive and promises a development of such magnitude that the old South Yorkshire coal possibilities sink into comparative insignificance and may be said to have been practically abandoned.

About 20 miles in length, the new South Yorkshire line is the joint property of no less than five of the larger railways, and although opened so recently as 1909 a very considerable traffic has developed and is rapidly increasing, whilst proposals for extensions are already under consideration. The two chief stations are Maltby and Dinnington, and the two collieries from which these stations take their names are each capable of lifting some 6,000 tons of coal per day under normal conditions. A third station, Tickhill, is situated in the vicinity of Rossington; but the proposed extensions may include an entry from Tickhill to Rossington Main Colliery, besides providing necessary outlets demanded by the rapid development of three or four other new collieries in the neighbourhood.

Moreover, there is a further prospective coal development throughout the district surrounding Doncaster as shown by the growth of the Bentley Colliery near by, and the Bullcroft Colliery served by Carcroft station on the West Riding Joint Line; and the Rossington Main already referred to; a development, in fact, of such importance that the early dream of the Great Northern Railway of monopolising the output of a South Yorkshire coalfield for the coal supply of its own system and London seems destined to be realised to a fuller extent than could then be anticipated. As indicating the extent of the traffic to-day an average day's working from Doncaster recently was 22 trains consisting of about 900 wagons.

For purposes of distribution the Great Northern coal traffic is collected at certain specified centres, and significantly enough these coal-collecting centres are situated at points which represented the various sectional termini of the line during the course of construction—Doncaster, Peterborough, London and Colwick. At these centres the empty coal wagons are collected and are worked thence to the various colliery stations and distributed to the respective colliery sidings. Here they are filled and in turn piloted to the nearest station, or as in the case of the South Yorkshire lowered by gravitation into the station sidings down an incline, whence they are worked to and accumulated at one or other of the collecting centres mentioned above. Here the loaded wagons are sorted and marshalled into trains and the process of coal distribution begins. Traffic for London and beyond is worked to Ferme Park sidings, which lie between Hornsey and Harringay in the near London suburbs.

Most of the remaining traffic is worked to Peterborough, where in the New England sidings the wagons are again sorted and marshalled for distribution in Lincolnshire, the Home Counties and local districts generally. Something like 40 trains a week with nearly 2,000 wagons are worked through from Colwick to Ferme Park and nearly twice that volume of traffic to New England; whilst from New England in addition to three daily trains with intermediate traffic for London, something like 100 trains comprising nearly 5,000 wagons are worked from New England to Ferme Park in a single week, representing traffic collected not only from Great Northern centres but from the North Eastern through Doncaster, the Great Central through Tuxford and Retford and from other sources.

At Ferme Park the same process of sorting and marshalling as at Colwick, Doncaster and New England is repeated, through trains being made up to carry South of London coal to Herne Hill, Hither Green, Battersea, Bricklayers' Arms and other depôts for still wider distribution; and the coal for London being worked to the numerous local coal depôts surrounding King's Cross.

Figures quoted in this article are for the most part unofficial estimations, and it should be understood that they have been collected from observation during war time, and therefore during a period of restricted working; but they are approximately correct as indicating the volume of traffic and are sufficient as showing the enormous development of the Great Northern coal traffic since the inception of the original South Yorkshire to London coal scheme.

Several thousands of wagons are still supplied by the Great Northern Railway, but the collieries themselves provide some tens of thousands more, and a continuous stream of coal, aggregating those millions of tons, passes daily from the various coal centres over the Great Northern system and beyond, representing a power and value in the national life and industrial wealth of the country which can be dimly recognised but certainly cannot be gauged by the value of the railway carriage receipts.

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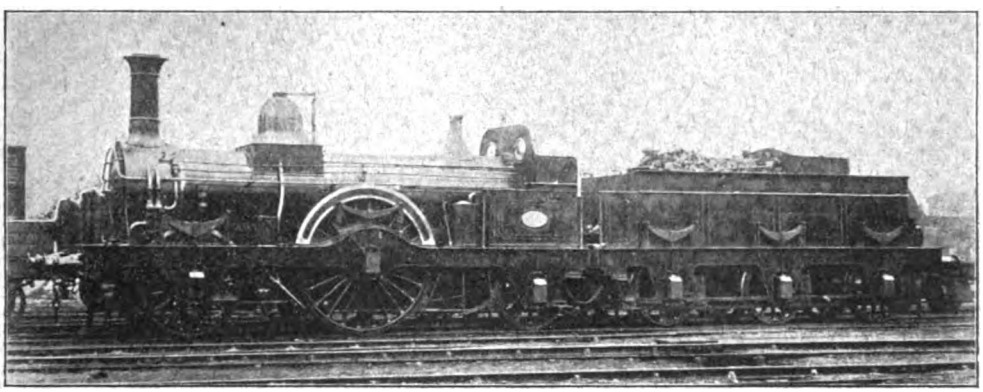
Locomotive and Train Working in the latter part of the 19th Century.

SOUTH EASTERN RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 348 (*Vol. XL.*), *June* RAILWAY MAGAZINE.)

FREQUENTLY known as the 118 class, the standard 2-4-0 engines next demand attention. Their prototypes, which I believe were afterwards assimilated with the class, were six engines, Nos. 179 to 184, built by Messrs. E. B. Wilson & Co., of Leeds to Mr. Cudworth's designs in 1857, only a short time before that once celebrated firm disappeared from the locomotive world. They began the new standard dimensions of 6-ft. wheels and 16 in. by 24 in. cylinders, remained the same as in Nos. 179 to 184 above. The heating surface was 965 sq. ft., grate area 21 sq. ft., and the total weight of engine in working order was 30½ tons. In 1857 these engines were considerably in advance of similar types built by other railways, and there was an excellent distribution of the weight on the wheels, due largely to the long firebox with sloping grate which allowed the trailing axle to be arranged beneath it. There was a great deal of polished brass work about the engines,



MR. CUDWORTH'S "MAIL" ENGINE, NO. 201.
Wheels, 7 ft.; cylinders, 17 in. by 22 in. Built by Kitson & Co., Leeds, 1861.
Fitted with the Smith "simple" vacuum ejectors.

but were not fitted with Mr. Cudworth's patent firebox to be mentioned later, and they usually burnt coke. Of these, No. 181 was the one selected to run trials against No. 118 when this new engine was turned out with the first patent firebox in 1857.

The engines of the 118 class, illustrated on page 382 of the June RAILWAY MAGAZINE (Vol. XL.), were the great feature of Mr. Cudworth's South Eastern designs. The cylinders and wheels throughout the 18 years 1857 to 1875, during which they were built, including the dome and safety valve cover, and very broad brass bands round the driving splashers. The chimney tops of most of them had polished copper caps, something similar to Mr. J. Armstrong's Great Western pattern of 1867-74. But a large number of Mr. Cudworth's 118 class and other engines were built with somewhat shorter plain chimneys of Fletcher's North Eastern pattern. Why these differences in chimney styles I cannot say, but it is remarkable that the great friend of the

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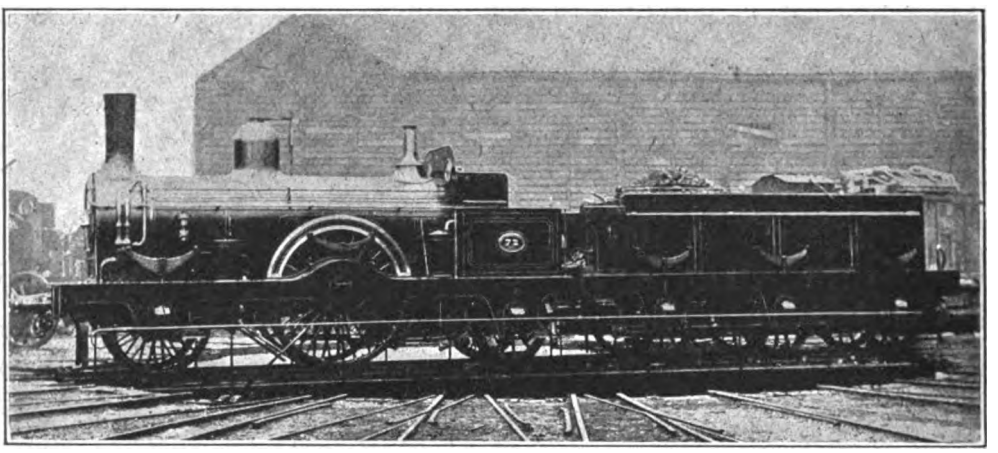
South Eastern, the Brighton Railway, did just the same thing until 1870, and built engines promiscuously having chimneys with copper caps and also of the plain Fletcher pattern. Seeing that in 1875 they comprised almost one-half of the locomotive stock, the 118 class were naturally to be found at every locomotive station on the line from London to Dover and Ramsgate on the one hand, and Reading on the other. They worked every sort of train from certain of the expresses to the slowest of locals, the latter work being almost as frequently performed tender first as chimney end foremost. They were not often to be seen on the Continental Boat and Mail trains to Dover, unless one of the 7 ft. singles was laid up and no other of that class happened to be forthcoming, but they were



Photo] [*Locomotive Publishing Co., Ltd.*

"MAIL" ENGINE, NO. 72.

Wheels, 7 ft.; cylinders, 16 in. by 22 in. Rebuilt at Ashford, 1878, with ordinary firebox.

generally entrusted (tender first) with the mail trains on the run from Charing Cross to Cannon Street, where their duties on those particular trains ended.

The most interesting and best known feature of the 118 class, in company with other tender engines, was the patent coal-burning double firebox on Cudworth's system.

The firebox shell was 8 ft. 1⅜ in. long, and the inside copper firebox 7 ft. 6 in. long inside. The grates, of which there were two, were very steeply inclined downwards from the firehole doors to the front end. The firebox was divided into two portions by a longitudinal partition with water space between, so that there were two separate grates, one on each side; these grates were each 1 ft. 6 in. wide, and two rectangular firedoors, one on each side of the footplate, were required. The grates were fired alternately, so that one had a bright fire when fresh coal was burning through on the other. At the front end, near the tube plate, there was a deep opening through the longitudinal partition, so that the gases from the separate grates could to some extent mingle together before passing through the tubes.

The genesis of this firebox was due to the fact that coke, which had been the fuel ordinarily used, was very expensive, and Mr. Cudworth sought a manner of solving the problem of burning coal slack, a much less expensive fuel. As Zerah Colburn and D. K. Clarke truly remarked in "Locomotive Engineering":—"To Mr. Cudworth locomotive engineers are greatly indebted for breaking up the routine practice of former years, in introducing and working out in a practical manner the long firebox for the purpose of burning coal slack."

The Cudworth firebox had the disadvantage that it involved complicated joints and rivetted seams exposed to the fire and subjected them to extra troubles caused by unequal expansion. But it would, nevertheless, have been adopted on other lines more than was the case, had it not been for one of those unforeseen occurrences that mar the best of labour. For just at the time when Mr. Cudworth was bringing out this solution of the coal burning question for locomotives, some interfering engineers on the Midland were experimenting on different lines, and in 1858 brought out the *brick arch*, which could

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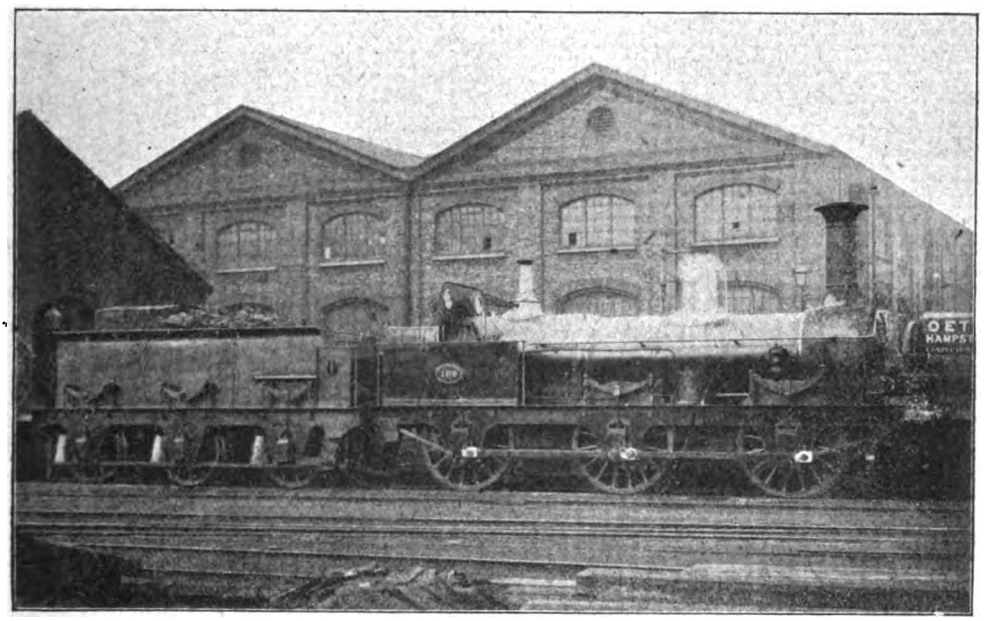
be used in an ordinary firebox of less complicated construction. The deflector plate had also just been introduced on the Birkenhead Railway, and between them the brick arch and deflector plate killed the "Cudworth," and its great rivals the Beattie and McConnell patent fireboxes. They existed on their own lines for a considerable number of years, and a great match was subsequently played between the Cudworth and Beattie systems, of which more anon.

I think the last of these fireboxes disappeared about 1890–1892. In 1887–8, No. 194, one of the 118 class, was performing on the Redhill and Reading trains, and was one

197 to 200	Vulcan Foundry	1861
201 to 204	Kitson	1861
27 and 116 ..	Ashford Works	1861
2, 43, 72, 81, 83 & 85	Ashford Works	1865–6

All the engines built in 1861 had 17 in. by 22 in. cylinders, and dimensions differing somewhat from those constructed in 1866, which for some unaccountable reason were somewhat smaller than their predecessors and had cylinders only 16 in. by 22 in. Nevertheless, the last batch contained two of the most famous of the class, Nos. 2 and 72. I was always given to understand that the 1861 engines usually burnt coke on the mail trains until Mr. James Stirling took



MR. CUDWORTH'S STANDARD GOODS ENGINE, NO. 109.
Wheels, 4 ft. 9 in.; cylinders, 16 in. by 24 in. Built at Ashford Works.

of the last that I remember. This was one of the very few engines that retained the old Cudworth copper capped chimney and brass dome to the bitter end. No. 74 had another of the last of the Cudworth original boilers and was a fellow companion on the Reading line, but this engine had a plain conical chimney. Both engines went the way of all engines in 1889–90.

The mail trains and Dover expresses were worked by the celebrated 7 ft. singles, and for their dimensions they were amongst the finest express engines of their day running in the whole country. There were only 16 of the class, of which the following is the list:

charge of the locomotive department, but that the 1866 engines used coal, after about 15 cwt. of coke had been used to fill the fireboxes.

Of these engines Nos. 2, 43, 72, 81, 199, 201, and 203 (and I believe 85) were stabled at Bricklayers' Arms, whilst 27, 83, 116, 197, 198, 202 and 204 were at Dover. I do not know the station of the other engine.

The heating surface of the No. 2 class was 973 sq. ft. for the tubes, and 132·3 sq. ft. for the firebox; total, 1,105·3 sq. ft. At one period they averaged only 21·34 lbs. of fuel per mile on trains of which the mean weight was 142·3 tons, at an average speed of 44·15

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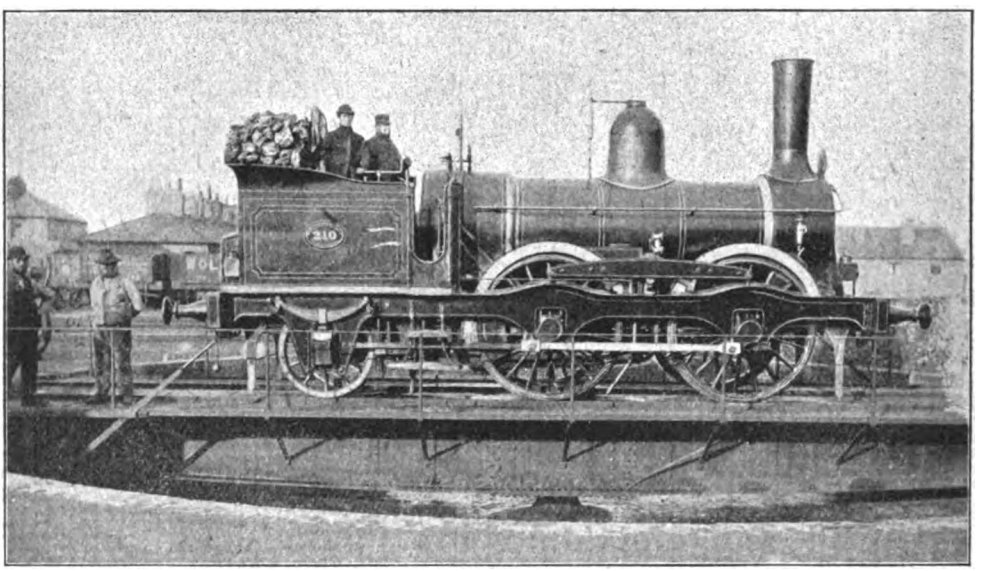
m.p.h. Whether coal or coke was the fuel I cannot say, but in any case the record is one of exceptional merit, when the severe nature of the South Eastern road to Dover is considered.

I also find that the 1861 engines had a total heating surface of 1,137 sq. ft. with a grate area of 21·2 sq. ft. and a boiler pressure of 130 lbs. They weighed 33½ tons, of which 12½ tons were on the drivers. The 1866 engines had the same weight on the driving wheels, but their total weight was 32 tons only.

I will leave the few notes which I have of their performances until later, and in the meantime return once more to the Cudworth from Nine Elms castle to do battle with the Cudworth dragon No. 2, whose den was at Bricklayers' Arms.

Now it is to some extent an axiom in locomotive circles that when an engine designed and built by Mr. L. H. Crosshead, of X Railway, is lent with the consent of the Board for competitive trials against another locomotive designed and constructed by Mr. R. H. Crank, of Y Railway, on the road of the latter, Crank's engine almost invariably comes out the best. And if it should also come to pass that a return match is played on the metals of X Railway, then Crosshead's engine always plays a very fine innings, being "not out" at the end of it,



Photo] [*Locomotive Publishing Co., Ltd.*

MR. CUDWORTH'S 0-4-2 TANK ENGINE (CLASS 205-214), NO. 210.
Wheels, 5 ft. 7 in.; cylinders, 15 in. by 20 in. Avonside Engine Co., 1864.

fireboxes, with which these engines were, of course, fitted.

The great rival of the Cudworth firebox was that on Beattie's system in use on the London and South Western Railway, for Mr. Beattie at the same period was also a recognised leader in the ranks of locomotive economists. Of course, each of the rival systems had its advocates, and in May and June, 1870, arrangements were made for comparative trials of each type. To this end Mr. Beattie's South Western engine No. 121, *St. George*, duly caparisoned with the *robur et aes triplex* of the well-known feed water apparatus, and also with the South Western form of coal-burning firebox, sallied forth whilst Crank's locomotive is either completely stumped or else "umpired out." Pursuing the investigation further, three profound conclusions of great scientific value are almost invariably reached as a result of the trials, to wit:

1. That the air of Crank's railway does not agree with Crosshead's engine.
2. That on Crosshead's railway the scenery and surroundings do not suit the taste of Crank's locomotive.
3. That both engines might just as well have stayed at home.

The trials on Y Railway are carefully conducted by Mr. Crank's chief assistant, Mr. Biler, who duly sends in a detailed and

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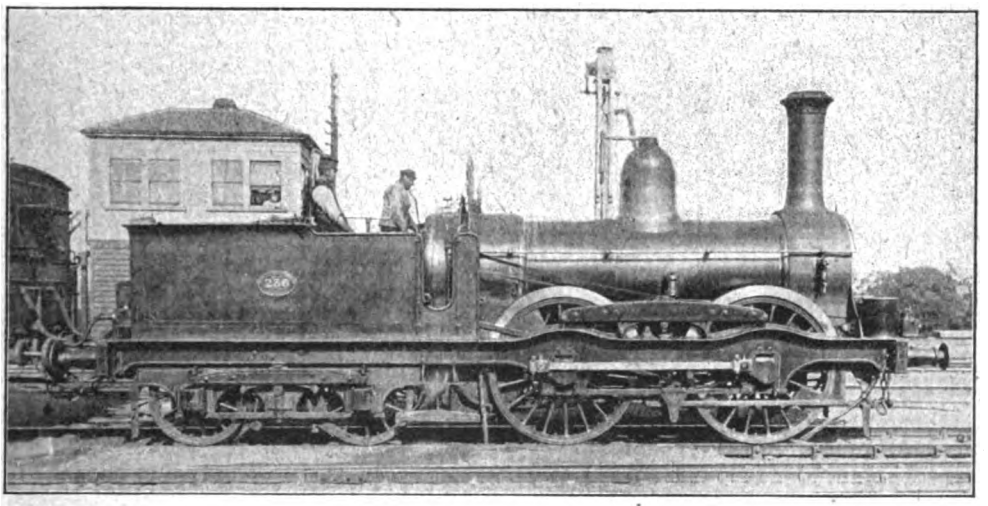
exhaustive report dealing with the defective points of Crosshead's, and the superlative merits of Crank's engine; whilst Mr. Ashpan, outdoor running superintendent of X Railway, compiles a neat little essay on somewhat similar lines, but with the rôles of the principal characters reversed. And, finally, a few years afterwards, when Mr. Crank and Mr. Crosshead retire for a well-earned rest, and Messrs. Biler and Ashpan reign in their respective steads, the latter gentlemen promptly scrap most of Crank's apparatus and Crosshead's patent appliances and start on a few little things of their own. Thus the inexorable law of locomotive progress!

a month on week-days between Cannon Street and Dover, and was relieved on Sundays by a sister engine No. 119 *Vesuvius*. The engines were driven by South Western drivers with South Eastern pilotmen, and returned each night to Nine Elms sheds under the watchful eyes of a South Eastern inspector. Moreover, the engine did not acquit itself at all badly, and even the South Eastern people had to admit that good time was kept, although they claimed the victory for their own engines, of which not only the celebrated No. 2 but others of the same class were matched against it.

The South Western people claimed that the Dover mail expresses were on some



Photo] [*Locomotive Publishing Co., Ltd.*

0-4-4 BOGIE TANK ENGINE (SERIES 235-241), NO. 236.

Wheels, 5 ft. 7 in.; cylinders, 15 in. by 20 in. Built by The Canada Works, Birkenhead, 1866.

As may possibly be surmised from the above digression, *St. George* had a real bad time of it between Cannon Street and Dover against the South Eastern dragon. According to divers authorities in the Bricklayers' Arms country, of varying degrees of reliability from zero upwards, the saint retired to his castle at Nine Elms with his shining armour badly bulged in several places, and a large piece bitten out of the brim of his halo—this being presumably repaired subsequently by means of a "roof patch" rivetted on.

Divested, however, of mythological legends, the only available particulars of the trials were to the effect that the London and South Western engine *St. George* worked for occasions run in 96 min. by *St. George*, and that their engine burnt only 23 lbs. of coal per mile. But the detailed particulars of the trials were always densely shrouded in a "fog of war," which has never lifted, and no bulletins were ever published.

I cannot say whether it is correct, but it used to be stated that the South Eastern 7 ft. single No. 2 paid a visit to Nine Elms, and for a day or two on the South Western tried to show *St. George* the proper way to prance to Salisbury. The reports as to the return visit are very conflicting, but if it actually occurred, the result was probably a foregone conclusion, for on this occasion it was *St. George's* day, and he would naturally make an awful example of

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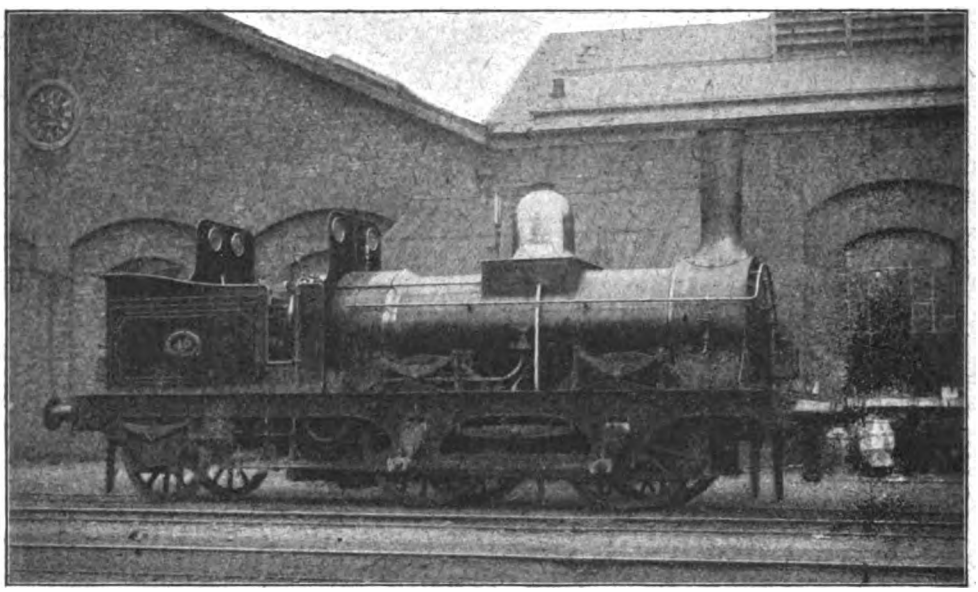
No. 2. Thus all was well that ended well, and they all lived happily ever afterwards. For Mr. Cudworth stuck faithfully to his patent double fireboxes, whilst Mr. Beattie just as religiously maintained his own coal-burning and feed-water-heating apparatus.

And in 1878, when both these gentlemen had departed, their successors, who by the way came from other railways, promptly proceeded to make a clean sweep of the lot.

Hitherto I have said nothing as to the speeds on the South Eastern. With engine 43 (7 ft. single) the "Tidal" express to Folkestone, which left Cannon Street at 10.55 a.m. and made stops at New Cross and Shorncliffe (signals), made the run of 70 miles in 85 min. The maximum speed was 65½ m.p.h., but several consecutive miles were covered between Tonbridge and Ashford at 61 and 62 m.p.h., the load being 10 coaches.

The fastest running was generally performed between the two points named. I have not got a Bradshaw of the period, and cannot verify the truth of the statement, but it was said that in May, 1877, the 9.37 a.m. from Ashford to London was booked at 53½ m.p.h. between Ashford and Tonbridge. Its timing throughout to London appears, however, to have been at the more modest rate of 44½ m.p.h., but a special "Granville" up express had the excellent running average of 47½ m.p.h. A train which in 1875 ran from New Cross to Canterbury West took 99 min. for the 65¼ miles, not quite 40 m.p.h.

In 1884 the 7 ft. single No. 204 took the 7.40 a.m. down mail from Cannon Street, with 15 coaches, and passed Ashford (54½ miles), where two coaches were slipped, in 74 min. The 12-mile ascent from New Cross to Halstead summit took 21 min., or an average speed of 35 m.p.h. This, it may be stated, was the average time generally taken over the same section by the then new 7 ft.



MR. CUDWORTH'S 0-4-2 TANK ENGINE, NO. 40.
Wheels, 5 ft.; cylinders, 16 in. by 22 in. Ashford Works, 1868.

coupled bogie engines of the 198 class. By the end of 1885 Nos. 2, 27, 82, 116 and 198 of the 7 ft. singles had been scrapped, others lasted a short time longer, having like 72 been supplied with flush boilers and short fireboxes of ordinary design. In some cases I believe the fireboxes were altered, but not the boilers. No. 72 finished her days about 1887 or 1888 on the Gravesend and Port Victoria branch.

Mr. Cudworth's standard goods engines (such as No. 109, shown on page 9) were rather on the small side with 16 in. by 24 in. cylinders and 4 ft. 9 in. wheels. These dimensions remained unchanged from 1855, when they were designed, until 1876, when

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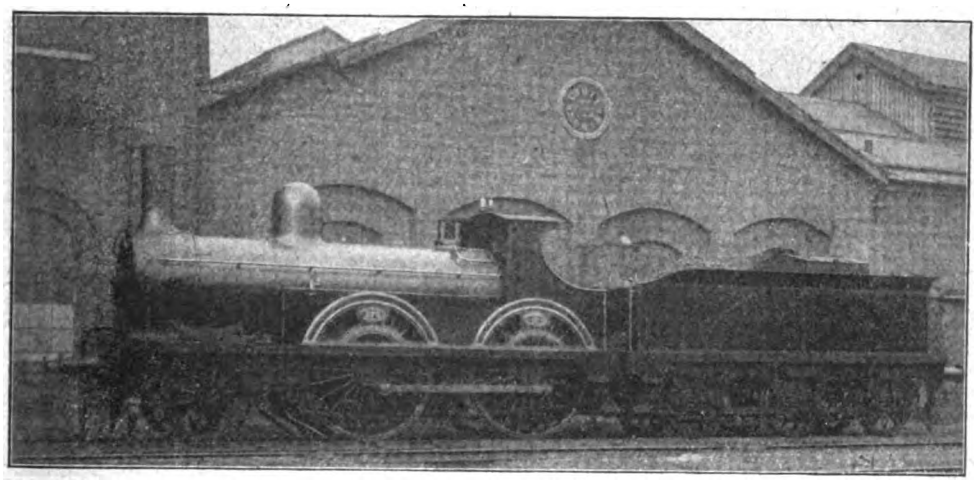
Mr. Cudworth retired.* A few of the latest of them, such as No. 256, were provided with cabs, and were, I believe, the only engines to have them. Front weatherboards without roof protection were always the order in Mr. Cudworth's day, and even after Mr. James Stirling took charge he always fitted the rebuilds of Mr. Cudworth's engines with front weatherboards, with, however, the addition of side-wings.

It would have been natural to suppose that the South Eastern with such an immense volume of local traffic, would have had a very large number of tank engines. As compared with its neighbour, the "Chatham," which had a great many, there were comparatively few. Possibly Sir Edward Watkin, the former well-known Chairman of the South Eastern, had not at that time come into a due appreciation of the merits of tank engines, for it can truthfully be said that the two principal railways of which he was Chairman, the South Eastern and the Manchester, Sheffield and Lincolnshire, worked almost the whole of a heavy local suburban traffic with tender engines, which spent half their time on the road in running tender first. But the South Eastern was in this respect a shade better than the other line mentioned, for there were 25 somewhat small tank engines for passenger work. Of these there were 12 engines similar to No. 210, and seven others, Nos. 235 to 241, built at the Canada Works, Birkenhead, had trailing bogies under the coal bunkers. Both types had 5 ft. 6 in. wheels and 15 in. by 20 in. cylinders, and were built expressly for working the "shuttle" service between Charing Cross and Cannon Street. The entrance to the footplate was opposite the side of the firebox, and the engines were somewhat awkward for the drivers. At one time they were to be seen regularly on the Cannon Street and Charing Cross services, but they were gradually withdrawn to other districts and broken up by Mr. Stirling. One of the 0–4–4 tanks drifted to Reading, where I used to see it piloting and pulling biscuits about the yard.

The Charing Cross service, for which these engines were built, appears now to be in some danger of extinction. The line to Charing Cross from London Bridge was opened in 1864, prior to which the latter place was the South Eastern terminus. Cannon Street was opened in 1865, and the shuttle service then introduced. But very recently, Charing Cross and its bridge over the river have come under the ban of the "Society for the Prevention of Cruelty to Londoners," and Mr. Burns, of Battersea, and others have been seized with an ardent desire to found a lovely "Garden City" on its site, which presumably will emulate the beauties of the one, of which an extensive and magnificent view may be obtained from the Battersea Bridge of the West London Extension line. It may be added



2–4–0 EXPRESS ENGINE (CLASS 259–278, KNOWN AS "IRONCLADS"); NO. 273.
Wheels, 6 ft. 6 in.; cylinders, 17 in. by 24 in.

* The earlier engines had, however, 15 in. by 24 in. cylinders, but many of these were subsequently enlarged to 16 in. One or two of them, *e.g.*, 127, had Mansell's wooden wheel centres.

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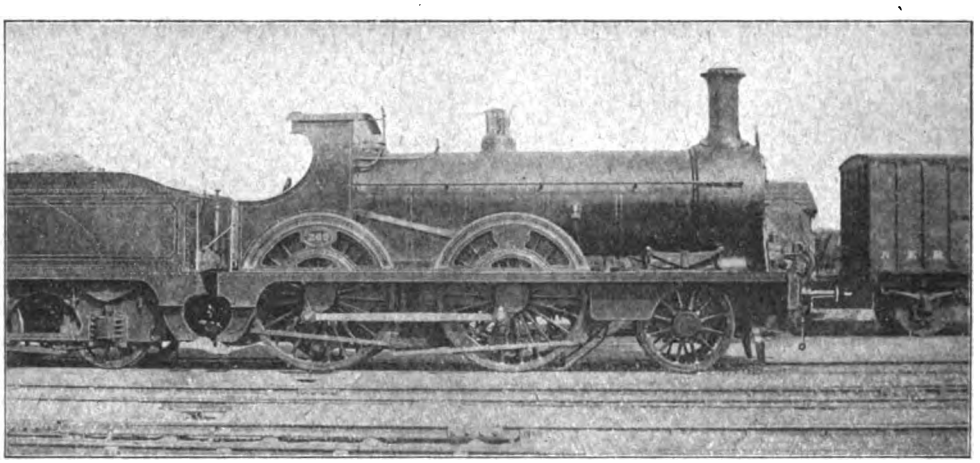
parenthetically that the verdant avenues of the latter delectable spot are in the right honourable gentleman's own constituency, whereas the proposed glades at Charing Cross are not.

Six other 0–4–2 tank engines for local trains on the North Kent line from London were built at Ashford in 1868. These had 5 ft. wheels and 16 in. by 22 in. cylinders, and of them Nos. 14, 15, 40 and 41 (though I used to see them, especially No. 40, on passenger trains into Cannon Street) appear to have been used principally on goods trains over the Dartford line from Bricklayers' Arms. One of the class worked the passenger service between Ramsgate and Margate. All the Cudworth tank engines of the above three classes were broken up between 1884 and 1893.

ances were to some extent shrouded in mystery. These were the 2–4–0 engines Nos. 259 to 278, which had inside bearings for all wheels. The diameter of the drivers was 6 ft. 6 in. and the cylinders were 17 in. by 24 in., and they had a total heating surface of 1,103½ sq. ft., of which the firebox contributed 102 sq. ft. They weighed 34¼ tons in working order, and carried 140 lbs. pressure. They were handsome engines with open splashers and plenty of brass beading, but their appearance was somewhat marred by the plain cast iron chimneys without caps. The first 10 were built by Messrs. Sharp, Stewart & Co., of Manchester, and the other 10 came from the works of the Avonside Engine Co., of Bristol, in 1876.

They were sometimes known as "Watkin's



2–4–0 PASSENGER ENGINE (SERIES 259 TO 278), NO. 269.
Rebuilt by Mr. J. Stirling.

Of goods tank engines there were only three rather curious single framed side tanks, Nos. 152 to 154, which worked the Folkestone Harbour branch. These were finished just after Mr. Cudworth's departure, and had two piston rods to each cylinder arranged above and below the leading axle, somewhat after the fashion of the Great Western broad gauge compound No. 8, except that the double rods on the latter were for the purpose of clearing the smaller high pressure cylinder and not an axle, and were arranged horizontally instead of vertically as in the South Eastern engines. Nos. 152–154 had 4 ft. 6 in. wheels, and 17 in. by 24 in. cylinders, and lasted about 15 years only.

At this stage we come to a class of 20 express engines whose origin and performengines," from the fact that they arrived when Mr. A. Watkin had charge of the locomotive department, but it was generally stated and accepted that Mr. John Ramsbottom, of former Crewe fame, was responsible for the designs. Moreover, rumour said that the directors thought they had better have some heavier express engines, and that they made arrangements accordingly "off their own bat." There was one little detail that seems to me to settle their origin apart from their undeniably Ramsbottom style, and that is that the wheelbase of 7 ft. 5 in. from leading to driving, and 8 ft. 3 in. from driving to trailing, was that introduced by that engineer in his first coupled express engines of 1866, and adhered to by Crewe for not only Mr. Ramsbottom's "Newton"

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but also for Mr. Webb's "Precedent" class.

The new engines also broke with another Cudworth tradition in that the original number plates were of the old Drummond style still in use on the North British Railway and were fixed on the driving splashers.

The mystery of their birth also attended their performances. Being the most powerful express engines that the South Eastern then had, they were naturally given the work of the fastest and most important trains, viz.—the Continental Mails,—and then they soon came off them. For some reason Mr. Cudworth's famous singles of the 72 class resumed their premier position at the head of the crack trains, and if ever a locomotive engineer enjoyed his consolation, Mr. Cudworth must have chuckled with satisfaction in his retirement. Anyhow, the 7 ft. singles were running the "Mails" to my knowledge for another seven or eight years, until Mr. Stirling's large 7 ft. coupled bogie engines took their places in 1884–5. What the trouble was with the "Ironclads," as the men used to call the 259 class, I cannot say from personal knowledge, but it used to be said that hot axleboxes had much to do with it, especially in regard to the tenders, the latter being a constant source of trouble. Whatever you may do with a Ramsgate seaside express in the way of stopping for a while to cool off a hot axlebox, you cannot play this game with the "Continental Mail Express." The verdict of the men was generally that otherwise they were good engines, but very bad starters.

So the "Ironclads" were sent to bombard Ramsgate and other seaside places that required heavy trains, whilst the "mails" were left to go their way in peace. They ran certain secondary fast trains to Dover, and Nos. 276 to 278 were quartered at the latter town, whilst most if not all the others put up at Bricklayers' Arms. I frequently saw them doing a good deal of the usual "tender first" work of the South Eastern in the London district, in company with the Cudworth coupled engines.

Mr. Stirling rebuilt all of them in 1888 to 1891 with domeless boilers, and at the same time put on the old Cudworth style of number plate, which he always retained. The majority finished their days in the Maidstone district, and Mr. Harry Wainwright broke them up in 1904–6.

(To be continued.)

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with by Mr. E. L. Ahrons are:—

L. & N.W.: Jan., Feb., March, May, 1915.
Great Northern: June, July, 1915.
M.S. & L.: Aug., Sept., Oct., 1915.
Great Western: Nov., Dec., 1915; Jan., Feb., March, April, May, June, July, Aug., 1916.
Glasgow & S.W.: Sept., Oct., 1916.
North Eastern: Nov., Dec., 1916; Jan., Feb., March, April, May, 1917.

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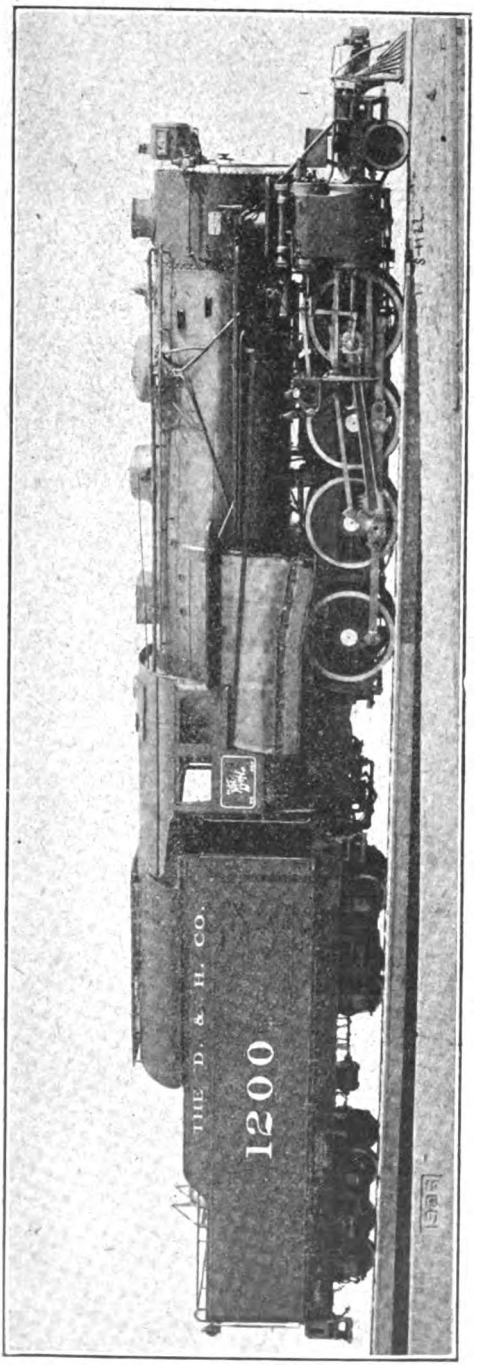
Largest 2-8-0 Type Railway Engine.



A MAMMOTH AMERICAN LOCOMOTIVE.

AS the largest of its kind in the world, ranks the locomotive illustrated. With others of the same type, it has recently been introduced for hauling heavy goods and mineral trains on the Delaware and Hudson Railway.

Its cylinders have a diameter of 27 in. and a piston stroke of 32 in., and the eight-coupled wheels are 5 ft. 3 in. diameter. The boiler has a diameter of 7 ft. 3 in., and it carries a working pressure of 195 lbs. per sq. in. Equipped for burning pulverised fuel, at the tests at the Atlantic City Exhibition the engine's consumption was at the rate of 6,000 lbs. of bituminous coal per hour.

Of the wide type, the firebox has a length of 10 ft. 6 in. and a width of 9 ft. The boiler contains 326 tubes 2 in. diameter and 46 superheater tubes 5⅜ in. diameter, the length in each case being 15 ft. Other particulars are as follows :—

Wheelbase, coupled	17 ft. 6 in.
,, total engine	26 ft. 7 in.
,, engine and tender ..	65 ft. 5 in.
Heating surfaces, tubes	3,509 sq. ft.
Firebox	251 sq. ft.
Arch tubes	54 sq. ft.
Heating surface, total	3,814 sq. ft.
Superheater surface	793 sq. ft.
Grate area	99·8 sq. ft.

Steam distribution is effected by means of piston valves working above the cylinders and actuated by Walschaert's motion. Maximum tractive power of the locomotive is 61,400 lbs. and the factor of adhesion 4·36. The tender is of the eight-wheeled pattern. It has a water capacity of 9,000 gallons and a fuel space sufficient for the conveyance of 14½ tons of coal, the latter being, as already mentioned, pulverised bituminous coal.

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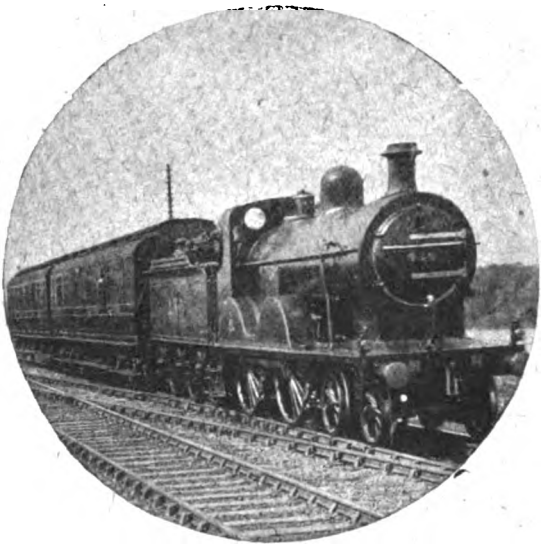
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*F. E. Mackay.*

MIDLAND RAILWAY.
Liverpool to St. Pancras Express between Liverpool and Chinley.

IN connection with the remarks that I made in the October, 1916, issue concerning accuracy of timing, I have received an interesting letter from a correspondent just returned from Nigeria, who has not had an opportunity of communicating with me previously on the subject. In sending the details of a recent run (*not*, I may add, timed in the wilds of West Africa, which hardly yet boast such material for railwayist enthusiasm as 100-mile non-stop runs and 80 mile-an-hour speeds!), he remarks: "The times were taken with an ordinary watch, not a stop-watch, and I should like to mention the method employed. As regards station times, these are read direct from the minute-hand (long hand) and are based on the supposition that I can tell *exactly* when the hand coincides with the minute division. If the passing occurs at such a coincidence, nothing further requires to be done, but if, as is more often the case, it occurs when the hand lies between two divisions, then I at once start to observe how many seconds elapse on the second-hand before the minute-hand reaches the next minute division, and then make the necessary subtraction. For example, a station is passed when the minute-hand lies somewhere between 11.8 and 11.9 a.m.; 37 seconds are seen to elapse before the minute-hand coincides with 11.9, therefore the station was passed at 11.8.23 a.m. I venture to think that station times so taken should not differ from those taken with a stop-watch by more than, say, 5 seconds, assuming the watch to be in good order and no mistakes made; as for discrepancies between the second-hand and minute-hand, which occur in most watches, they are much too small to be noticeable in the short space of less than 60 seconds which is involved."

I cannot help thinking that the method here outlined is an unnecessarily laborious one. The condemnation of watches in general is very sweeping, and it need not be supposed that any reasonably good watch would show the variation between second and minute-hand to which my friend refers, *i.e.*, that the second-hand does not take exactly the same time to make a circuit of its dial as the minute-hand to travel one minute on the larger dial. I have not noticed such a discrepancy in the watches that I have used hitherto, and although my present watch is a chronograph of fairly good quality, I may say that I always take station passing times with the ordinary minute and second-hands, by a direct reading, using the centre-second-hand for mile-post readings only. This, I believe, is the method employed by most observers. It seems to me that the possibility of not correctly "spotting" the coincidence of minute-hand and minute division in the method outlined in the last paragraph might result in a greater margin of error than any variation in the relations of second and minute-hands.

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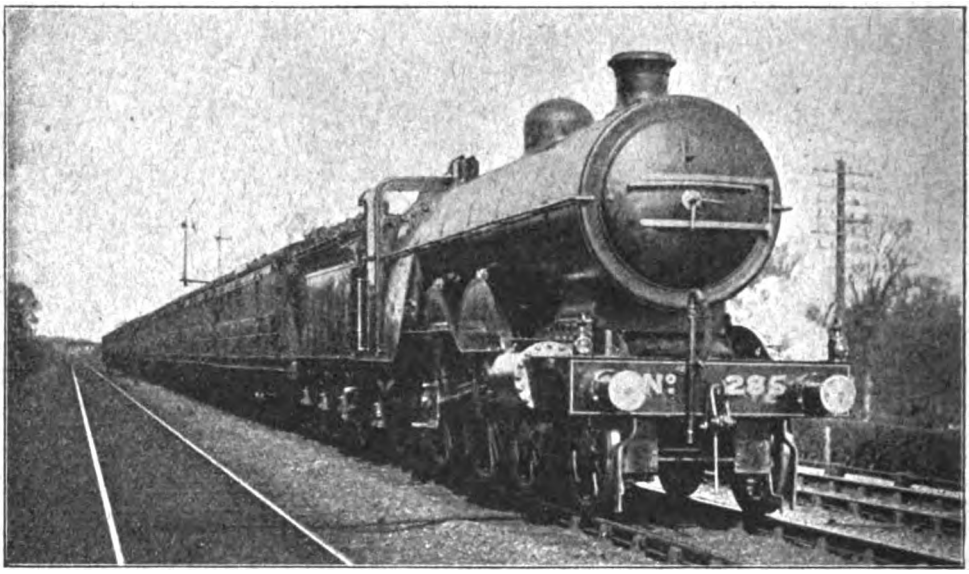

Photo] [*R. Hall.*

GREAT NORTHERN RAILWAY.
Up Express Train passing Wymondley. 4-4-2 locomotive, No. 285.

As regards mile-post timings with an ordinary watch, my friend continues: "These cannot possibly be taken with greater accuracy than to ½-seconds, but with care one should be able to do this, at any rate in the early stages of a journey when the attention is alert and the eyes are not tired. Probably the results are more accurate with slow uphill speeds of 20–30 m.p.h. than with downhill speeds of 70–80." That goes almost without saying. "I doubt if your objection that 'with an ordinary watch the travelling of the eye from post to watch quite precludes anything in the nature of real accuracy' is so serious as you say. It is true that perhaps a second may elapse while the eye is travelling, but exactly the same phenomenon will occur at each post. That is to say, while the stop-watch observer will note the time from, say, post 67 to post 67¼ and thence to post 67½, the observer with the ordinary watch will note the time from a point 20 or 30 yards beyond 67 to a point 20 or 30 yards beyond 67¼, and thence to a point 20 or 30 yards beyond 67½. Quarter-miles will thus be accurately timed, though not identically the same ¼-mile lengths as with the stop-watch." There is a good deal in this argument, I admit, when a whole series of posts is being "clocked," one after another, but in writing as I did I had more in mind the casual observer, who "takes" a quarter-mile here and there, at the top of a bank or the foot of a gradient, when the chances of error in reading are appreciably greater. Further, it needs very considerable experience to time to half-seconds with an ordinary watch. "Of course I do not suggest for one moment," the letter continues, "that timing with an ordinary watch, even when the ½-second standard of accuracy is attained, can take the place of stop-watch or chronograph timings by the fortunate possessors of those instruments, but it certainly does not need to be ruled out of court if the observer takes any pains." I quite agree. But "taking pains," alas! is an exercise which to many "observers" is altogether foreign.

Apropos of the same subject a young friend writes from North Wales: "The other day I was thinking if no more accurate means of ascertaining speeds with an ordinary watch could be devised. It seems to me that the chief source of inaccuracy is the time taken to transfer the eye from the mile-post to the watch. Well, why not listen to the ticks of the watch? My watch ticks every ¼-sec., and by this means, counting every two ticks, times to a ¼-sec. can be accurately noted, after a bit of practice. I used this method yesterday, and found it quite simple; the only difficulty is not to confuse wheel-beats with ticks." This seems quite a brainy idea, but I fancy it would be a good deal less easy, or would require a good deal more calculation, with a watch such as

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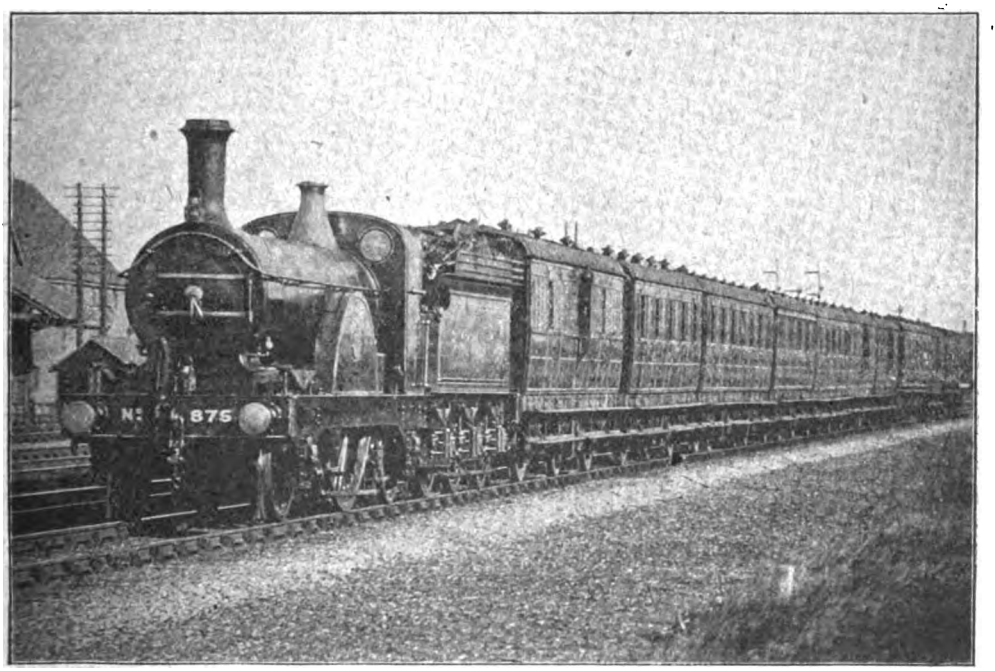
mine, which ticks *five* times to the second. And what about timing at night, off rail-joints? My brain positively reels at the conception of counting rail-joints and watch-ticks at one and the same time! After all, it is not necessary to be the "fortunate possessor" of an expensive chronograph in order to take stop-watch readings. There are numbers of quite reliable stop-watches on the market, at very moderate prices, which used in conjunction with an ordinary watch afford the observer all the benefits that a chronograph can offer. The suggestion is put forward for what it may be worth.

It had been my intention to give in the present issue a somewhat extensive tabular statement of runs on the Great Northern Railway between York and London, by the up day "Scotsman," which should be in a sense complementary to the series on the 2.20 p.m. *ex*-King's Cross that occupied our attention in the June issue of last year. But a gentle reminder from Editorial quarters that in view of the shortage of paper and the curtailment of space the "exuberance of my verbosity" in these columns simply *must* be curbed compels me to adopt a somewhat less ambitious programme. So I will confine myself to a description of my most recent journeys on the Great Northern Railway immediately prior to the decelerations of January last. Some of these were in one respect or another the most noteworthy of any in my whole experience of that line.

In October, 1916, I gave some details of running on the 1.30 p.m. Leeds express *ex*-King's Cross at the time when it was conveying the Harrogate portion previously leaving at 1.40 p.m. The last of these journeys, timed just after that article was written, was one of the finest of all, in that time was kept with the heaviest load in the series. 1401 was the engine—a superheater "Atlantic" driven by Parker—and 13 bogies the load, including a Gresley "twin," 378 tons empty and about 405 tons with passengers and luggage. A fairly brisk east wind was experienced beyond Ripton, but beyond that the weather was fine. There was slight slipping in Maiden Lane Tunnel, but that did not prevent us from making the fair time of 8 min. 25 sec. to Finsbury Park, 2·5 miles; the slight slack through Wood Green Tunnel, however (the engineering caution here now appears to have become permanent), caused us to drop to 35 m.p.h. on the ascent to Potters Bar, so that it took us 24 min. 35 sec. to pass that station, 12·7



Photo] [*C. Laundy.*

GREAT NORTHERN RAILWAY.

Peterborough to Boston train. 2-2-2 locomotive, No. 875.

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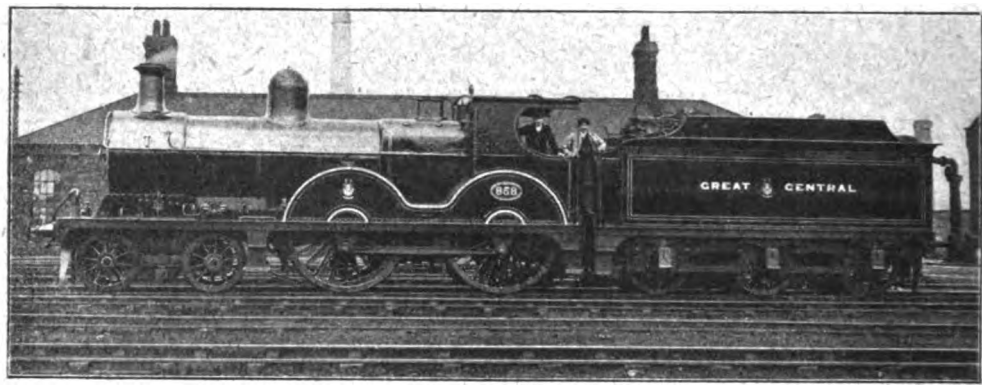

Photo] [*P. F. Cooke.*

GREAT CENTRAL RAILWAY.

Pollitt 4–4–0 engine, No. 858, rebuilt with Robinson superheater. Fitted with Galloway-Hill patent furnace.

miles, and 30¼ min. to Hatfield, 17·7 miles. Now came a splendid exhibition of sustained speed. Touching 70 m.p.h. beyond Hatfield, we breasted Woolmer Green Summit at 52½, and then for a long distance near Three Counties sustained 82 m.p.h., falling to 74 beyond Arlesey and then again reaching 77½ at Biggleswade. Passing St. Neot's at 62½ m.p.h., we touched 70 at Offord, went up Stukeley bank with a minimum of 52, and had a final "burst" at 75, sustained, before Holme. This excellent running resulted in times of 13 min. 40 sec. from Hatfield to Hitchin, 14·2 miles; 9 min. 25 sec. Hitchin to Sandy, 12·2 miles; 12 min. 55 sec. Sandy to Huntingdon, 14·8 miles; 4 min. 55 sec. thence up to Ripton, 4·6 miles; and 10¼ min. on to Fletton Junction, another 11·5 miles, the 75 miles from London to this point having taken 81 min. 25 sec. The journey from King's Cross to Peterborough, 76·4 miles, was thus completed in 83½ min.—only ½-min. over schedule after passing Hatfield 7¼ min. late—its most remarkable feature, of course, being the time of 51 min. 10 sec. for the 57·3 miles between Hatfield and Fletton Junction.

Resuming with the same engine from Peterborough, we all but regained that half-minute, and so virtually kept time on this very fast schedule. Banked in rear for a hundred yards or so at the start, we nevertheless found some difficulty in getting "going," taking 16 min. 20 sec. to Essendine, 12·2 miles; 27 min. 20 sec. to Corby, 20·7 miles; and 31½ min. to Stoke Summit, 23·7 miles. This is, of course, for fully 15 miles a continuously rising grade, culminating with 3 miles at 1 in 178, on which the speed fell to 40½ m.p.h. But with some more thoroughly smart running we covered the 54·9 miles from Stoke on to Doncaster in 56 min. 10 sec., despite the fact that the wind was making itself more strongly felt, especially from Newark onwards. We touched 68 m.p.h. before Grantham, 71½ near Claypole, 68 before Retford and 65 at Ranskill, while the minima were 43 m.p.h. at Markham Box and 48½ at Piper's Wood. Intermediate times were: from Stoke to Grantham, 5·4 miles, 5½ min.; Grantham to Newark, 14·6 miles, 13¼ min.; Newark up to Markham, 13·5 miles, 14½ min.; Markham down to Retford, 5 miles, 5 min. 5 sec.; Retford to Piper's Wood, 10·7 miles, 10½ min.; and Piper's Wood into Doncaster, 6·7 miles, 7 min. 20 sec. The aggregate from Peterborough to Doncaster, 79·6 miles, was thus 87 min. 40 sec., and from King's Cross, 156 miles, the gross running time was 171 min. 10 sec., including starting from and stopping at Peterborough—a fractional excess on schedule time that was much more than offset by the early permanent way delay through Wood Green Tunnel.

From this run I pass to one on the 10 a.m. "Scotsman" *ex*-King's Cross, which shows that there are certain combinations of load and weather that not the most experienced of drivers is able to combat. On this occasion we totalled 14 vehicles, 12 of the most modern vestibuled 8-wheeled stock, one 12-wheeler, and a North Eastern "compo," attached in rear at the last moment, of the privacy of which I joyfully availed myself. This isolated position, however, I found later to have decided drawbacks from the commissariat standpoint, and the joy just mentioned was eventually tempered by acute

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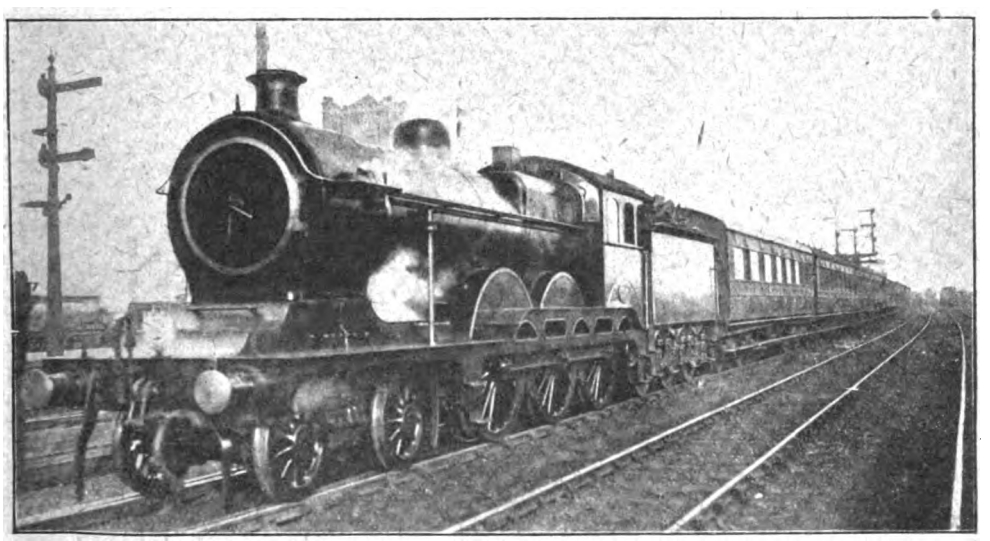
pangs of hunger before we reached Newcastle. The day was as bad as a day could be, a thaw after one of the most generous of last winter's contributions of snow resulting in a thick Scotch mist, which made the rails terribly slippery. So even the genius of Warren, on the Royal "Atlantic" No. 1442—now superheated—was barely sufficient to enable us to surmount the initial bank out of the terminus. With a load of which the tare totalled 416 tons, and the aggregate, packed with passengers and luggage, fully 445 tons, the limited adhesion of the engine—only 36 tons—was no match for the greasiness of the rails up to Holloway, and we struggled up the 105–110 of the incline at an average of something like 5 miles an hour. The net result of this was seen in the modest times of 15 min. 20 sec. out to Finsbury Park, 32 min. 10 sec. to Potters Bar, and 37 min. 55 sec. to Hatfield, these all being the longest in the whole of my experience. They only emphasise further the desirability of some arrangement for banking out to Finsbury Park, which should be attended with no danger provided that the precaution was taken of getting "line clear" to that point before the train concerned was allowed to leave the terminus. Much, indeed, of the extra time now allowed down Great Northern expresses is frittered away on this early stage, when loads are heavy and the weather is bad, which means that the running beyond Hatfield must be nearly as hard as heretofore, and the saving in coal and general wear and tear by deceleration but limited.

I knew that Warren would do his utmost to make amends for this sad state of affairs so soon as he got the opportunity, and I was not mistaken. The mist continued fairly thick until beyond Stevenage, so that we did not hurry very greatly on the Hatfield–Hitchin stage, which took 14 min. 20 sec., with a maximum of 67 m.p.h. beyond Hatfield, and a minimum of 48½ at Woolmer Green. But once through Hitchin we went like a veritable tornado. Passing that town at only 71½ m.p.h., we were doing 79 at Three Counties, and then reached 80 at Arlesey; falling to 74 beyond Arlesey, we ran from Biggleswade to Sandy at 77½, were doing 75 at Tempsford, and actually went over St. Neot's "hump" at 68 m.p.h.—a thing I have never previously done with even a small load, let alone 445 tons. A final "sprint" at 75 an hour past Offord took us through Huntingdon at 69 m.p.h., and then we went up the three 1 in 200 miles of Stukeley bank with no lower rate than 53½ m.p.h. After that, alas! came a permanent way check at Ripton, spoiling our chance of a record time from Hitchin to Peterborough. As it was, however, we had done marvellously. Just as our time out to Hatfield was my longest on record, so was that from Hitchin to Huntingdon—21 min. 40 sec.—easily my shortest. It might even have been less than 21½ min. with normal



Photo] [*W. H. C. Kelland.*

GREAT EASTERN RAILWAY.

Up Liverpool Street train at Cambridge. 4-6-0 locomotive, No. 1510.

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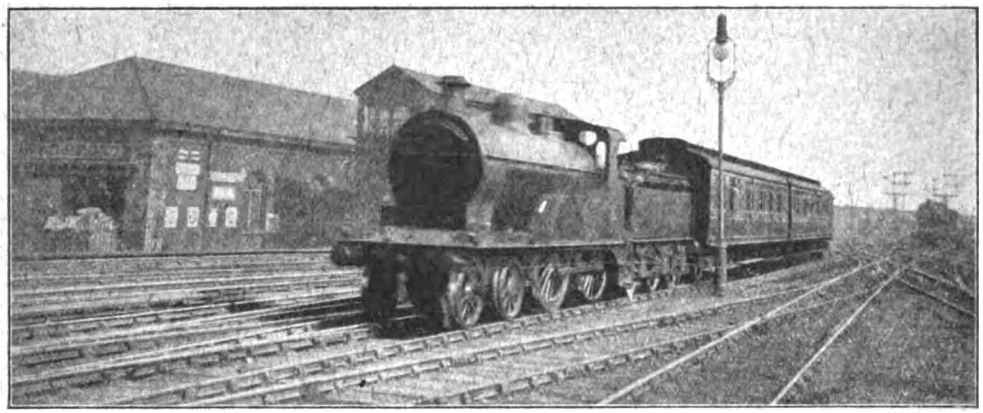

Photo] [*Cecil J. Allen.*

MIDLAND RAILWAY.

Special express train running into Carlisle.

speed through Hitchin, but even at the actual figure the speed over this stretch averaged all but 75 m.p.h.—74·8 to be precise. In conversation with an East Coast guard at King's Cross the other day, a friend and myself cited this time—"under twenty-two minutes"—as an example of what drivers like Warren can do at a pinch. "Under twenty-two minutes?" queried the guard. "No! I can't credit that! I expect you mean just under *thirty*-two minutes." And I fear my friend and I were rude enough to laugh!

The actual point-to-point times beyond Hitchin were 9½ min. from Huntingdon to Sandy and 12 min. 10 sec. thence to Huntingdon; 5 min. 5 sec. from Huntingdon to Ripton, including the preliminary slowing for the track repairs, and 6¼ min. thence to Holme, with 7 min. on to Peterborough—total 92¼ min. from King's Cross, 90¼ min. net. The remainder of the journey to Grantham was moderate in character—15½ min. to Essendine, 17 min. 10 sec. thence to Stoke, with a minimum rate of 31 m.p.h., and 7 min. 5 sec. from Stoke to Grantham, total 132 min. from London, or 130 min. net. With banking in rear out of King's Cross the net time would probably have been 2 hours or less. Onwards to York Wright, on No. 1404, superheater "Atlantic," made some first-class running. We touched 71½ m.p.h. at Claypole, and only fell to 42 at Markham, passing Newark, 14·6 miles, in 17 min. 50 sec.; Markham, 27·1 miles, in 31 min. 40 sec.; Retford, 33·1 miles, in 37 min.; and Doncaster, 50·5 miles, in 56 min. 5 sec. Thenceforward we ran into a thicker fog than ever, but still, with slows to 45 m.p.h. at Doncaster and 20 m.p.h. at Selby, we completed the 18·4 miles between these towns in 20 min. 10 sec., and the 13·8 miles from Selby to York in 19 min. 25 sec.—total 95 min. 40 sec. from Grantham, 82·7 miles, and 1 min. 20 sec. under schedule time. This was a creditable achievement with so tremendous a load. Among some runs on the same train of which details have been forwarded by a correspondent (considerations of space forbid me to give the runs *in extenso*, I am afraid) I notice some remarkable work by the same engine, with an even heavier load, which totalled empty no less than 455 tons, and full, in all probability, nearly 490 tons. Unfortunately the details are scanty, no maxima or minima being shown, nor times at the summit points. But Newark was passed in 16 min. 55 sec., Retford in 36 min., Bawtry in 45 min. 10 sec., Doncaster in 54 min. 40 sec., Selby in 75 min. 25 sec., and York was reached in 95 min. 10 sec., nearly 2 min. under the time allowed. This was the more remarkable in that snow showers from the start developed into a heavy snow storm from Bawtry on to York.

From the same source I may mention a couple of runs between London and Grantham on the morning "Scotsman," which suffer, however, from the same defect of inadequate particulars. A run with 1442 was noted on a "misty" day, and presumably the difficulties experienced were akin to those of my run, as, although the load was only 365 tons tare on this occasion (probably about 390 tons full), the time taken to Finsbury Park was 10 min. 35 sec., to Potters Bar 24 min. 50 sec., to Hatfield 30 min. 10 sec., and to Hitchin 45 min.

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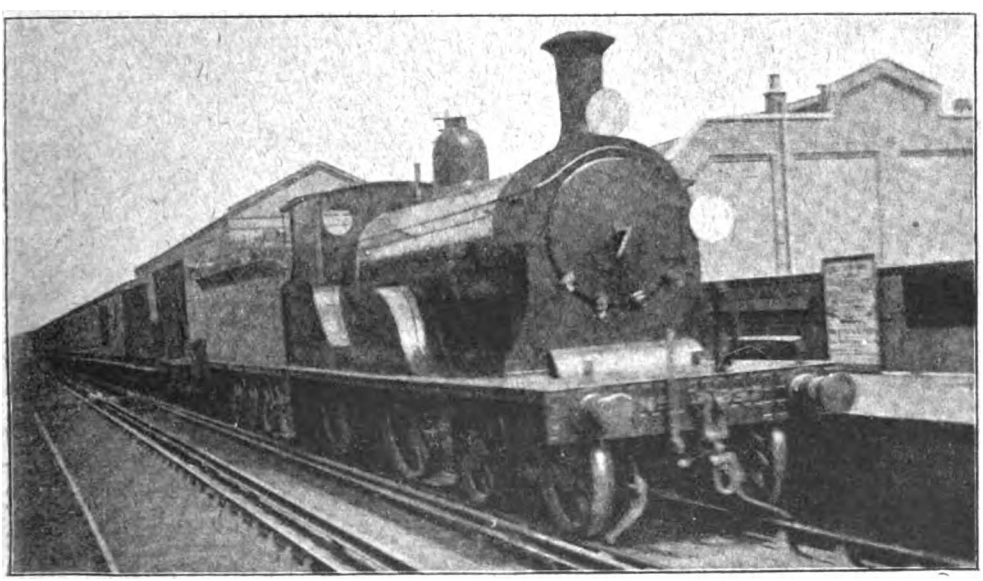
10 sec. Thenceforward the character of the work steadily improved until beyond Peterborough it became brilliant. Hitchin–Huntingdon took 23 min. 40 sec., Huntingdon–Peterborough 16 min. 50 sec. (total time from London 85 min. 40 sec.); Peterborough–Essendine 13¼ min.—an astonishing time, this; Essendine–Corby, 8·3 miles, 9 min. 50 sec., and Corby–Grantham, 10 min. 10 sec. No time or minimum speed at Stoke is given in the log, but to run from Peterborough to Grantham in 33 min. with this load is an uncommonly fine feat. The total time from London for the 105·5 miles was thus 118 min. 55 sec., the train being more than a minute inside schedule on arrival. No. 279, the famous four-cylinder superheater "Atlantic," gave a most decorous display with 360 tons tare load (about 385 tons full). Taking 9¼ min. out to Finsbury Park, she passed Potters Bar in 23 min. 20 sec.; Hatfield in 28½ min; Hitchin in 41½ min.; Huntingdon in 65 min. 5 sec.; Peterborough in 83 min. 10 sec.; Essendine in 98¼ min.; and reached Grantham in exactly 2 hours, to the second.

I will complete my down runs with the mention of yet one further on the 10 a.m. train *ex*-King's Cross, which, as regards its possibilities, was even finer than any which have gone before. Unfortunately I was not able to get the number of the engine, only noticing that it was a superheater "Atlantic"; the load was a substantial one of 11 eight-wheelers, all the latest stock, and a twelve-wheeler, 357 tons tare and 380 tons gross. Starting magnificently, we were through Finsbury Park in 7 min. 40 sec., touched 53 m.p.h. at Wood Green, sustained 46½ m.p.h. up the 1 in 200 until well past Hadley Wood, only falling to 43 just at the summit, and so breasted Potters Bar in 21 min. and Hatfield in 26 min. exactly. Touching 72½ m.p.h. beyond Hatfield and only falling to 55½ at Woolmer Green, we were through Hitchin in 39 min. 25 sec. from the start, and Arlesey, 37 miles, in 43½ min., the highest speed here being 75 m.p.h. Now had we repeated the running which I recorded with No. 1442 between Hitchin and Peterborough, we should have been through the Cathedral City in 77½ min., even though the distance be 76·4 miles, and a repetition of my friend's experience with the same engine and load beyond Peterborough would have given the truly startling time of 110½ min. to Grantham. As it was, however, we eased down very markedly, passing Sandy in 49¾ min.; Huntingdon in 64 min. 25 sec.; Peterborough in 82 min. 50 sec.; and Essendine in 98 min. 10 sec. The time of 14 min. 10 sec. for the 11·5 miles from Essendine to Stoke was, however, very good, as was also the minimum of 44 m.p.h.



Photo] [*L. R. Tomsett.*

LONDON AND SOUTH WESTERN RAILWAY.

Military Mail Train.
4-4-0 locomotive, No. 337.

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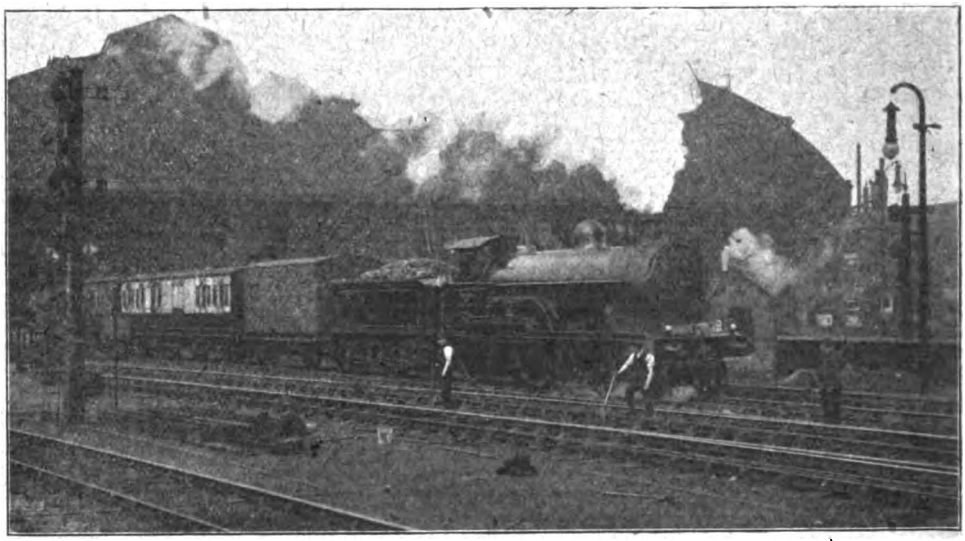

Photo] [*W. H. Whitworth.*

LONDON AND NORTH WESTERN RAILWAY.

Train leaving London Road station, Manchester. 4-4-0 locomotive, No. 89, *John Mayall.*

at the summit, and eventually we reached Grantham in 118 min. 35 sec. from the start. It is quite clear that with merely normal running between Hitchin and Essendine this time might have been 114 min. or so. At Grantham another superheater "Atlantic" came on, and did quite well to get through Newark in 17 min. 25 sec.; Markham in 32 min. 50 sec.; Retford in 38 min. 5 sec.; and Doncaster in 56 min. 35 sec., but after that we suffered signal checks all the way to York.

On the return journey I could describe a whole string of really excellent journeys on the day "Scotsman" that was until recently due in King's Cross at 6.15 p.m., as between York and Grantham. With loads of 50 to 56 or 57 axles we have time and again run the first-mentioned section in net times of 94 to 96 min., thus duplicating my experiences on the 2.20 p.m. down, but I have found it much more rare to run to time south of Grantham. Space forbids me to enter into details of the runs just instanced, but I cannot forbear describing one on which the load was one of the largest I have seen on the Great Northern Railway since the time of the coal strike. Out of York we had 4 twelve-wheelers and 10 eight-wheelers, with a small "eight" to be slipped at Doncaster, making 68 axles as far as the latter place, and 64 axles forward. Empty, the weight of the vehicles totalled 455 and 433 tons on these two sections respectively, and full about 490 and 465 tons. No. 1457, superheater "Atlantic," was the engine. From the start we covered the 2 miles to Chaloner Whin Junction in 4 min. 40 sec., passed Escrick, 7·1 miles, in 10 min. 40 sec., and Selby, 13·8 miles, in 18 min. 10 sec. Prior to the swing-bridge slack we were doing 62½ m.p.h., but speed was then reduced with excessive caution to 22 m.p.h. On the level between Selby and Doncaster we did a level mile-a-minute, after recovering speed, reeling off the 18·4 miles between these places in 21 min. 5 sec.; but at Doncaster, also, although all signals were off, the pace was positively funereal, not exceeding 35 m.p.h. Getting away again, we fell to 40 m.p.h. at Piper's Wood, and touched 60 at Scrooby, covering the 6·7 miles from Doncaster to Piper's Wood in 8¾ min., and the 10·7 miles thence to Retford in 11 min. 50 sec. The ascent of Markham bank was first-class, the minimum of 43 m.p.h. enabling us to complete the 5 miles from Retford to the summit box in 6 min. exactly, and a maximum of 71½ m.p.h. beyond gave a time of 12 min. 40 sec. from Markham to Newark, 13·5 miles. Passing Newark at 64 m.p.h. we did splendidly again up to Grantham, covering the 10·4 miles to Barkstone in 11 min. 25 sec., and the last 4·2 miles to the stop in 6 min. 20 sec.—total 96¼ min. from York. Despite the ultra-cautious reductions of speed at Selby and Doncaster, we had therefore by this

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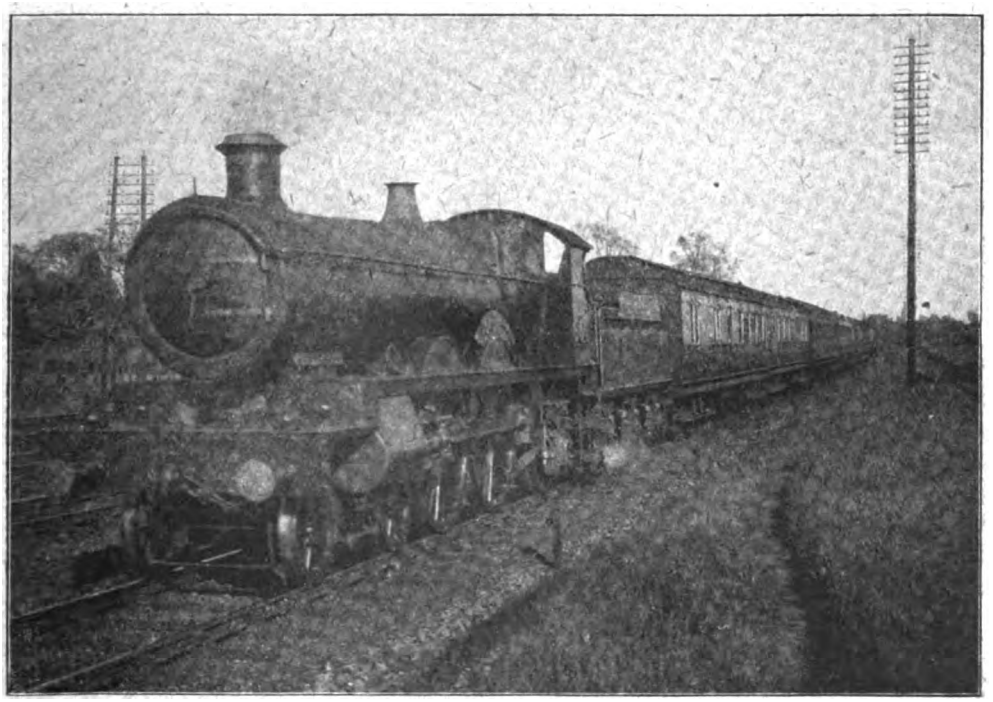
magnificent running gained 1¾ min. from York to Grantham, the time of 57 min. from Doncaster to Grantham being an exceptionally fine one under the circumstances.

I will not pain the reader by a description of the rest of the journey to town on that occasion, as we contrived to lose nearly 15 min. by feeble running on the part of an engine that I will forbear to name. But shortly afterwards I had a run on the up Newcastle express due in King's Cross (at that time) at 1.45 p.m., and now at 2.7 p.m., which amply made up for any shortcomings on the previous trip. The engine was No. 1401, now superheated, driven in superb style by Hall, of Grantham shed, who afforded me one of the finest south-bound runs I have ever had in the whole of a fairly extensive Great Northern Railway experience. Thirteen large 8-wheeled corridor coaches constituted the load, scaling 370 tons empty, and 400 tons with passengers and luggage. It was evident from our initial time of 11½ min. to Stoke—6·4 miles, rising uninterruptedly at 1 in 200—that something good was to follow, and so it turned out. We accelerated with great rapidity, passing Bytham at 79 m.p.h., then sustaining 82 for miles beyond; even Tallington was passed at 80 m.p.h., and the rate had not fallen below 75 when we ran past Helpston. Indeed, the 15·2 miles from Corby to Helpston were covered in 11 min. 50 sec.; Essendine, 16·9 miles, was passed in 21 min. 35 sec.; Helpston, 23·6 miles, in 26¾ min., and, with no slack over the troughs, we reached Peterborough in the excellent time of 32 min. 30 sec., start-to-stop.

Re-starting, after a halt of 6 min. 35 sec., we passed Holme, 7 miles, in 10¼ min. at 62½ m.p.h., and went up the 4¼ miles at 1 in 200 past Abbot's Ripton with no lower rate than 45½ m.p.h. Ripton, 12·9 miles, was passed in 16 min. 35 sec., and Huntingdon, 17·5 miles, in 21 min. 35 sec., at 71½ m.p.h.—a rate that was further renewed at Offord. The 7·2 miles from Huntingdon to St. Neot's occupied 6 min. 25 sec.; the 7·6 miles thence to Sandy 7 min. 10 sec.; and the 7·1 miles from Sandy on to Arlesey 7 min. 10 sec. Speed fluctuated from 60 m.p.h. at St. Neot's to 65 at Tempsford, 60 at Sandy, 62½ at Biggleswade, 56 before Arlesey and 61½ immediately after. Thus Hitchin, 44·5 miles from Peterborough, was



Photo] [A. J. Luce.

GREAT WESTERN RAILWAY.
Down Cheltenham Express near Slough.
4–4–2 locomotive, No. 189, *Talisman* (now converted to 4–6–0 wheel arrangement and numbered 2989).

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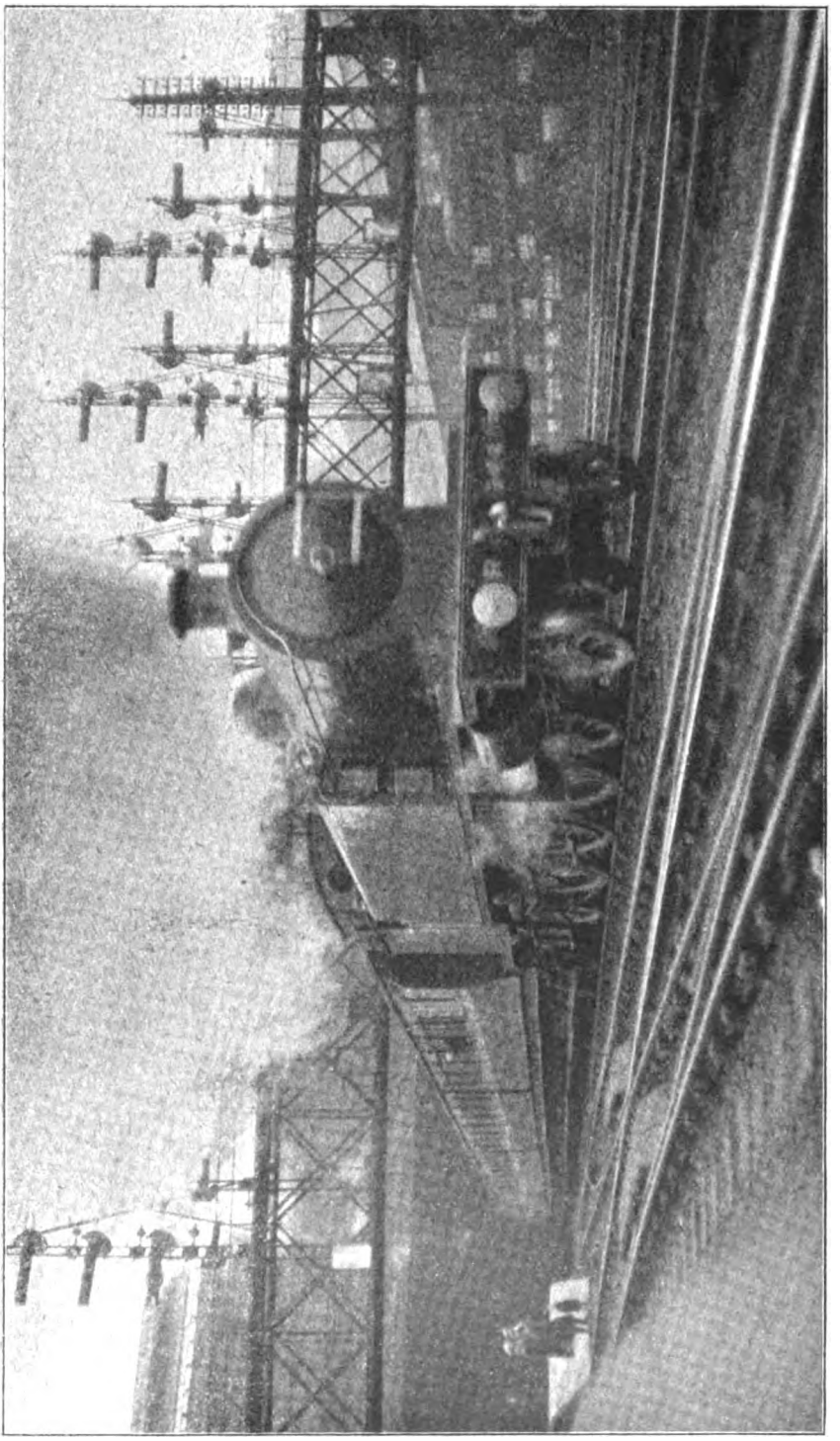

[Photo] [Captain R. A. Chrystal.

CALEDONIAN RAILWAY.
Stopping train leaving Edinburgh for Glasgow.
4-6-2 tank locomotive, No. 944.

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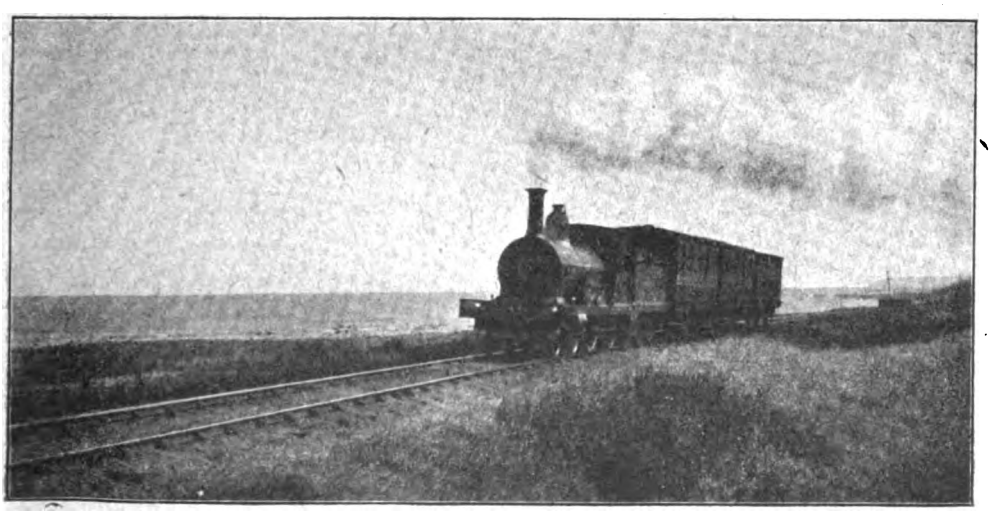
passed in the remarkable time of 47 min. 55 sec., the 27 miles from Huntingdon to Hitchin having actually been covered in 26 min. 20 sec.! At Stevenage we dropped to exactly 40 m.p.h., the 6·9 miles from Hitchin to Knebworth taking 9 min. 5 sec., but accelerated again to 70 m.p.h. at Hatfield, covering the 7·3 miles between Knebworth and Hatfield in 7 min. 20 sec., and the 5¼ miles on to Potters Bar in 5 min. 25 sec. Down to Finsbury Park the rate was comparatively moderate, not exceeding 71½ m.p.h., although we sped through the last-mentioned station at fully 60 m.p.h.; so the 12·7 miles from Potters Bar right into the terminus took us 13 min. 5 sec. The gross time from Peterborough was thus 82 min. 50 sec.—a gain of over 2 min. on a schedule of the probable observance of which in years past I should have had grave doubts with any load exceeding, say, 300 tons. From Huntingdon our time was 61¼ min. (58·9 miles) and from Hitchin 34 min. 55 sec. (31·9 miles). Inclusive of a wait of over 6½ min. at Peterborough we had run from Grantham to London in 121 min. 55 sec. (the non-stop schedule of the up day "Scotsman"), while our actual running time from Grantham was 115 min. 20 sec. Non-stop we should have completed the journey in 114 min. or less—a really phenomenal feat with such a train as 400 tons.

Even this load pales, however, beside that run on this train on a subsequent occasion, on a run of which a correspondent sends me details, when a further two corridor eight-wheelers, a non-corridor bogie, and a six-wheeled van helped to compose the formidable total of 463 tons, or it may be assumed, 500–505 tons gross, to which the train was made up. This was on the booking mentioned in the last two paragraphs, and needless to say was altogether too herculean a task for No. 1405—a superheated "Atlantic"—to achieve without loss of time. On the basis of the present schedule of the train in question—34 min. from Grantham to Peterborough and 93 min. thence to London—the loss would have been but small, however. From Grantham to Peterborough the actual time taken was 37 min. 12 sec.; the details given on this length are rather scanty, and do not even give the passing time at Stoke summit, although it would appear that the speed attained on the 1 in 200 ascent was all but 30 m.p.h. Restarting from Peterborough, Holme was passed in 11 min. 24 sec., but it took 19½ min. to get through Ripton, speed falling to 33 m.p.h. on the ascent, and 25 min. 49 sec. to Huntingdon. From there some fine work was performed, the times of 7 min. 3 sec. between Huntingdon and St. Neot's, and 7 min. 47 sec. St. Neot's to Sandy, indicating practically a sustained mile-a-minute rate over this stretch, while 8 min. 31 sec. from Sandy to Arlesey and 6 min. 23 sec. on to Hitchin were under the circumstances good times also. This gave a total of 55 min. 35 sec. for the 44·5 miles from Peterborough.



GREAT NORTH OF SCOTLAND RAILWAY.

Banff-Tillynaught branch line train.
Old 4-4-0 locomotive, No. 43a.

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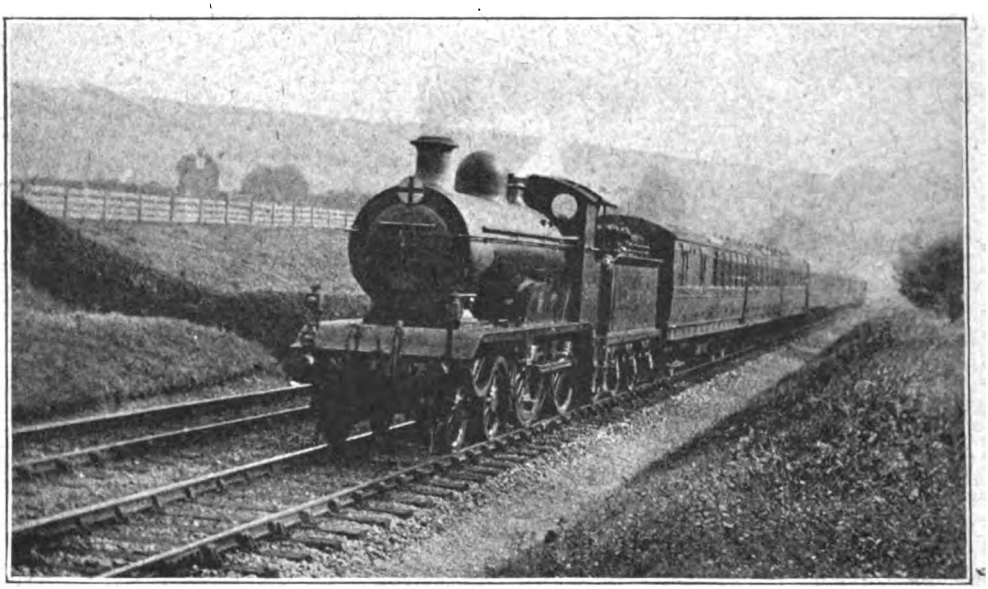

Photo] [*T. B. Welch.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.
5.5 p.m. Express Train Brighton to London.
4–4–0 locomotive, No. 207.

Going up to Stevenage the rate fell to 30 m.p.h., 11 min. 31 sec. being taken from Hitchin to Knebworth and 7 min. 55 sec. thence to Hatfield; after that 5 min. 23 sec. from Hatfield to Potters Bar and 14 min. 12 sec. on into the terminus completes the tale of the journey. Now the last-mentioned time including a signal check at Copenhagen Box, so that the gross time of 94 min. 36 sec. from Peterborough to London is reduced, in its net value, to very little over 93 min., which is the present booking of this train. Consequently if the result of the reduced train services is to produce loads of this magnitude during the summer months, even the most drastically decelerated of the trains may on occasion afford observations of the greatest interest from the standpoint of locomotive performance under difficulties.

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

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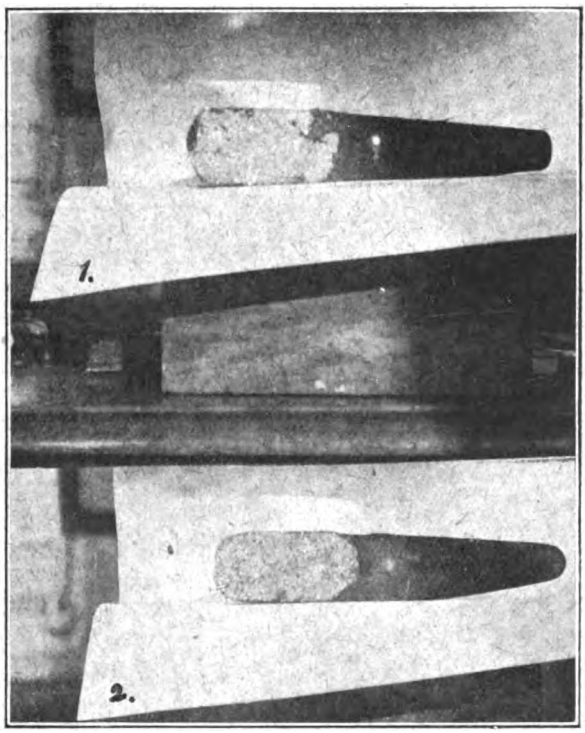
The Inspection of Broken Material in Railway Practice.

By H. C. WEBSTER, Inter.B.Sc., M.I.Loco.E.

IT will be readily understood that the condition of material broken in ordinary working is not infrequently a matter of very great importance to the railway concerned, since upon it depends to a large extent liability for injury, damaged goods, loss or delay, and from it are often formed modifications of design or principle, thus for example, if it be considered that the failure of locomotives of a particular type through (say) broken crank pins is excessive and if the fractures are in the generality of cases quite sound, it follows that the section could be advantageously increased, and in this manner the condition of fractured material is a very considerable guide to design; it also forms a basis of investigation as to the cause of the breakage, as will be shown later.

By far the majority of cases of broken material occur on wagons and hauled stock generally and it is principally these that will be considered. Locomotive failures from this cause are now only a small proportion, due to the efficiency of design and construction and to care in the selection and testing of material. Cases do occur, of course, where an engine has to give up its train as the



1. DEFECTIVE DRAWHOOK.
2. SOUND DRAWHOOK.

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direct result of a breakage and when this is the case the consequences are very often serious. The writer has in mind a recent case where, owing to a flaw at the back bolt hole of the bottom leg, a connecting rod strap broke through and caused extensive damage to the cylinders, not only entailing a costly repair, but resulting in a delay of 4½ hours to the train and blocking the main line for three, and of course the gravity of a broken axle does not require to be enlarged upon here.

But as a general rule, of the total engine failures not more than 25 per cent. would normally be attributable to broken material and this percentage would largely be made up of broken rings, broken springs and buckles, broken couplings and, where they are used, the breaking of Westinghouse pump reversing spindles.

I give below a table showing typical locomotive failures through broken material and giving the cause where possible; failures from other causes over the same period number 58, so that the percentage here (24·3) is very approximate to that given above:

Engine failed owing to	Caused by
Spring Buckle breaking	Defective Material.
R. Trailing Brake Rod breaking	Defective Material.
Steam Brake Piston breaking	Defective Material.
Left Bogie Spring breaking	Wear and Tear defects.
Steam Brake Valve Casting broken	Defective Material.
Tender Brake Stretcher broken	Defective Material.
Rivets broken in R. Trailing Hanger	Wear and Tear defects.
Thread of Injector Steam Cock stripping	Wear and Tear defects.
Piston Valve Rings breaking	Bad fitting.
R. Leading Spring Buckle breaking	Wear and Tear defects.
Damper Band breaking off	Struck by big end, rod bent allowing damper to open too far.
Coupling Link breaking	Defective Material.
Piston Valve Head breaking	Defective Material.
Spring Hanger breaking	Defective Material.
Main Blower Pipe Collar breaking off	Bad brazing.
R. Driving Spring breaking	Wear and Tear defects.
Piston Valve Ring breaking	Bad fitting.
Piston Head breaking	Defective Material.
Failures caused otherwise than by broken material—56	Total—18. Proportion 24·3%

It will be seen that a defect in the material accounts for most of these mishaps and the remarks made in the treatment of hauled stock fractures will equally apply.

Carriage and wagon failures through broken material fall under three heads, viz.:

(*a*) Defective material.
(*b*) Worn material.
(*c*) Negligent operation.

Considering first (*a*) the most common defects met with in practice are the flaw, the bad weld, and the old defect or final fracture of a piece already damaged or cracked. Flaws, of course, are principally due to imperfections in the metal and are usually distinguishable by discolourations. Figs. 1 and 2 show two broken drawhooks. In Fig. 1 the flaw is plainly seen as a small dark patch at the top of the fracture; in Fig. 2 the surface is uniform in colour and crystalinity and may be taken as a good example of a sound fracture. Fig. 3 shows a flawed spring plate.

Bad welding defects are generally to be distinguished by the flatness of the separated surfaces where they have come apart at the scarfing. Fig. 4 illustrates a defectively welded coupling link in which this is clearly shown. Sometimes, however, owing to incorrect heat when working, material such as a drawhook will not separate completely but only over a short length in the body of the piece normal to the plane of the fracture.

Old defects are frequent and caused by initial cracking due to excessive stress. This breaks the skin of the metal and allows the weather to enter, with deleterious effects.

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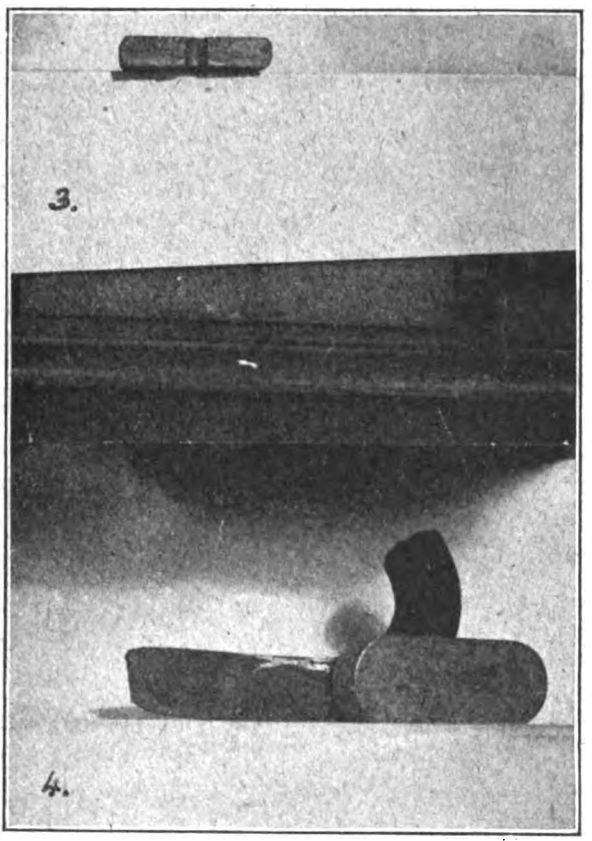
A defective piece may run for a considerable time before actually breaking until the stress and weather in combination gradually decrease the section to breaking area.

Fig. 5 shows a drawbar eye fracture caused by an old defect. The early broken part is seen as rusted and contrasts with the fresh part broken in the final rupture.

Considering next (*b*) breakages due to the material having worn below the proper limits are not so frequent as those due to the last are concealed from their view and therefore run a greater risk of escaping observation until worn to the breaking area.

Fig. 6 shows a coupling shackle that has worn to an area where normal stress was able to break it. There is no reason why by proper examination the condition of the piece should not have been discovered and a renewal effected.

Finally, considering (*c*) it may be said that negligent operation accounts for 50 per cent.



3. FLAWED SPRING PLATE.
4. DEFECTIVE COUPLING LINK.

flaws, but nevertheless occur extensively. It is the practice of most railway companies to issue regulations for the guidance of their train examiners which give minimum dimensions fixed either by the designers of the vehicle or by the Railway Clearing House.

Coupling links, coupling shackles and drawbar pins might be said to constitute the chief parts causing failure by excessive wear. The first two should be detected by the examining staff but frequently are not, of the failures of hauled stock through broken material. A bad stop or a bad start if the train be heavy will assuredly account for a drawbar or a coupling link, sometimes even for a buffer casting or an end board. The inertia of heavily laden goods trains is, of course, very great indeed and unless both care and skill are exercised in starting and stopping there is bound to be a breakage somewhere. The careful driver will ease his train along almost truck by truck until the

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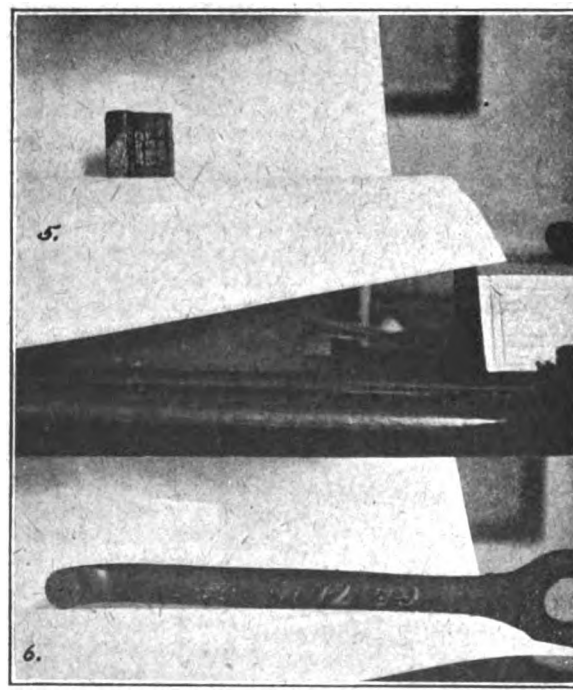
inertia is practically destroyed, when he is free to "open out" to any extent.

It often happens, too, that the guard has not released his hand brake at all or sufficiently before starting, which adds just enough live load to snap a link or drawbar eye. Whilst shunting and bad loading account for a few failures, there is not the likelihood of damage occurring through these causes that there is of damage whilst on the running road.

the manufacturers. If worn it is possible that the examining staff are at fault, and if sound, those operating the train, unless the result of a mishap such as a collision or derailment.

The condition of the fracture renders it difficult sometimes to state with assurance whether sound or defective. Mishaps frequently occur at places a considerable distance from headquarters and even from local stations where its examination is likely



5. DEFECTIVE DRAWBAR EYE.
6. WORN COUPLING SHACKLE.

In any case a sound fracture well up to gauge may be taken as a sure indication that those who operated the train are responsible for the breakage and would render the working company liable for any consequence. It is usual for the driver or guard, as the case may be, to receive notice of the damage and caution to use more care in future working.

It will thus be seen how the condition of a fracture points to the cause. If the material is flawed, of course none are responsible but to be carried out. Consequently the fracture is often completely rusted over or defaced by dirt, which makes it difficult to decide its condition and adds considerably to the weight of the report of the official who first inspects it. In important cases the fracture is protected by a covering of lead foil.

In conclusion it may be said that a complete and thorough examination of material broken in ordinary railway working is very important and is frequently the deciding factor in matters of great consequence.

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ANOTHER RAILWAY KNIGHTHOOD.

King's Birthday Honour for the Lancashire and Yorkshire Railway General Manager.

Photo] [*"Daily Sketch," Manchester.*

SIR JOHN A. F. ASPINALL, M.INST.C.E., M.I.MECH.E.
General Manager, Lancashire and Yorkshire Railway.

THROUGHOUT the British railway world general satisfaction was expressed on the announcement being made that H.M. the King had honoured with knighthood Mr. John Audley Frederick Aspinall, General Manager, Lancashire and Yorkshire Railway. Sir John is the only general manager of a British railway who has succeeded to the position of chief executive officer from that of chief mechanical engineer. Son of a distinguished lawyer, who was for many years Recorder of Liverpool, he was born in 1851 and was educated at Beaumont College, Berkshire. From Beaumont he entered the Crewe works of the London and North Western Railway, and was successively pupil of Mr. John Ramsbottom and of Mr. F. W. Webb, who appointed him to be Assistant Works Manager in the steel-making department. In 1875 he went to Ireland to become Works Manager of the Great Southern and Western Railway at Inchicore, and in 1883 he was made Locomotive, Carriage and Wagon Superintendent of the same railway. From Inchicore he returned to England in 1886 to become the first Chief Mechanical Engineer of the Lancashire and Yorkshire Railway. In this capacity he had charge not only of the locomotive, carriage and wagon departments, but also of all mechanical and electrical appliances and the electric lighting arrangements. When he took over those duties, the company's works at Bury and Miles Platting were quite antiquated, and those at Horwich were laid out under his supervision. He became General Manager in July, 1899. He was Chairman of the General Managers' Conference at the Railway Clearing House in 1907, and was President of the Institution of Mechanical Engineers, 1909 and 1910, and is now Vice-President of the Institute of Civil Engineers. He is a member of the Railway Executive Committee.

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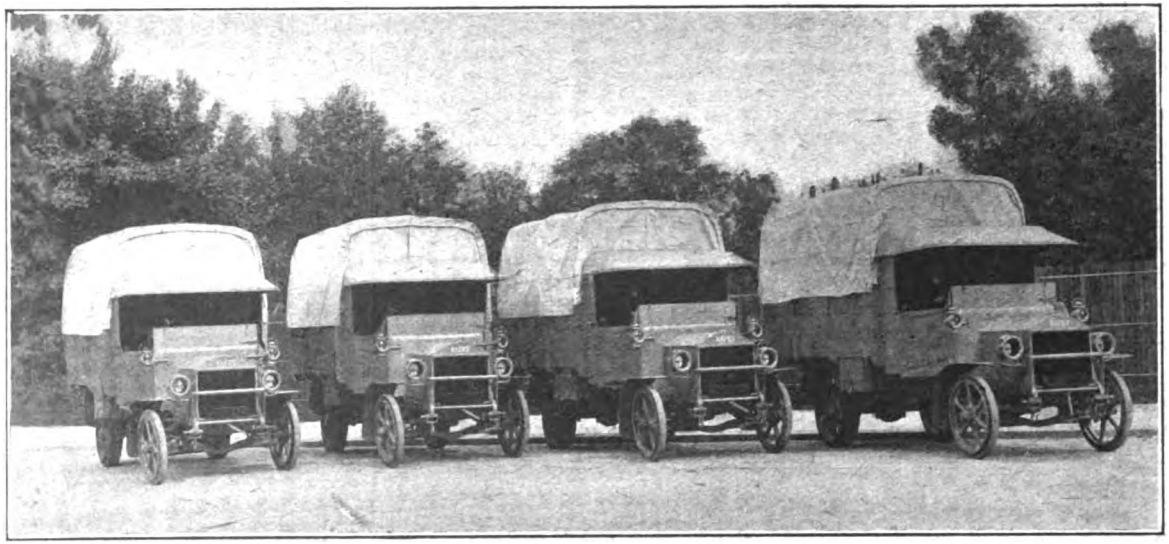
MUNITION WAGONS FOR THE BRITISH FORCES.



Photo] [*D. Napier & Son, Ltd.*

ROAD-MOTORS share with the railways the credit of remarkable achievements in connection with military transport. By the courtesy of Mr. H. T. Vane, Managing Director of Messrs. D. Napier & Son, Ltd., manufacturers of Napier Motors, 14, New Burlington Street, London, W., the RAILWAY MAGAZINE is able to illustrate part of a fleet of Napier munition wagons supplied to the British Army.

The chassis is the well-known extra strong Colonial Napier model, which has earned the highest reputation for strength and reliability, in addition to silence, which is a big factor, having regard to the fact that these wagons approach very close to the firing line.

It will be remembered that prior to the outbreak of War, the Colonial Napier underwent a very severe test, occupying five days, under the official observation of the Royal Automobile Club, over trackless ground, and this wonderful performance has been more than equalled by continuous rough usage in War service at the Front.

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The North Wales Narrow Gauge Railway.

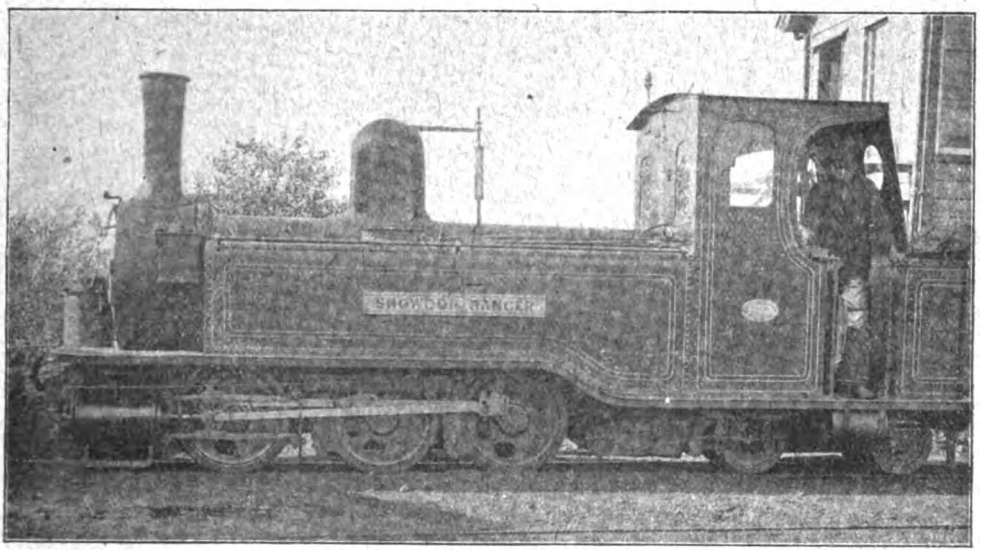
By H. L. HOPWOOD.

FOR its comparatively small area, Wales possesses a considerable railway mileage, this in a measure being due to the great mineral wealth of the country. Apart from the four "English" railways—the London and North Western, Great Western, Midland, and Great Central, which have important interests (and in the case of the two former, large mileages) in the Principality—there are at least a dozen local railways of standard gauge, and almost as many of narrower gauge. As regards the narrow gauge systems, one might say, without going very far from the truth, that the various widths of gauges almost equal the number of railways themselves. Actually, the proportion is about one to two, the subjoined list showing six different gauges divided among eleven railways :—

Gauge. ft. in.	Railway.
1 11½	Festiniog.
1 11½	North Wales Narrow Gauge.
1 11½	Penrhyn (a).
1 11½	Portmadoc, Croesor and Beddgelert (b).
1 11½	Vale of Rheidol.
2 3	Corris.
2 3	Talyllyn.
2 4½	Glyn Valley.
2 6	Welshpool and Llanfair.
2 7½	Snowdon Mountain.
4 0	Padarn (a).

(a) Steam worked mineral railways ; (b) Horse worked ditto.

It will be noticed that the gauge most frequently met with is that measuring 1 ft. 11½ in. between rails. Although narrowest in width, it occupies the premier position in regard to mileage among the Welsh narrow gauge lines. This circumstance is somewhat remarkable, and is probably due to the fact that 1 ft. 11½ in. was the size adopted for the pioneer of all narrow gauge systems, the Festiniog Railway.



NORTH WALES NARROW GAUGE RAILWAY.
0-6-4 Fairlie locomotive, *Snowdon Ranger*.

A line of similar gauge to the Festiniog is the North Wales Narrow Gauge Railway, which, as the title implies, is situated in North Wales, and extends from Dinas

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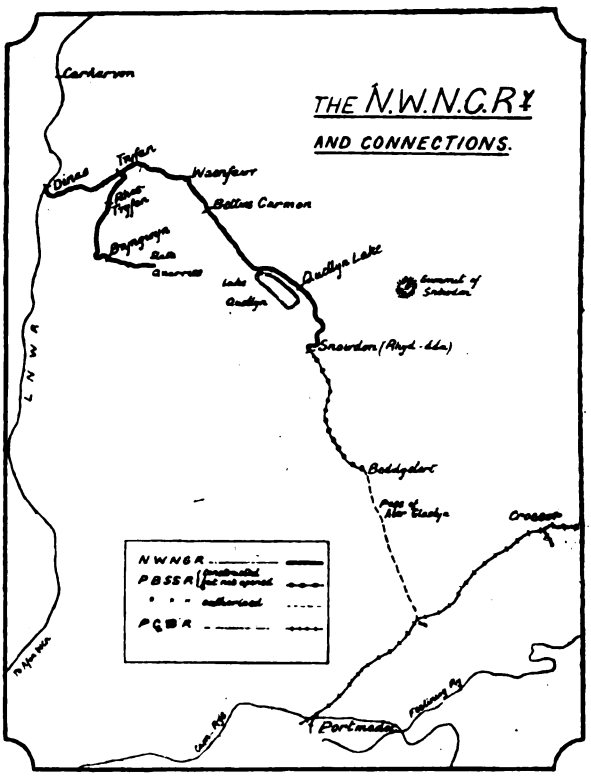
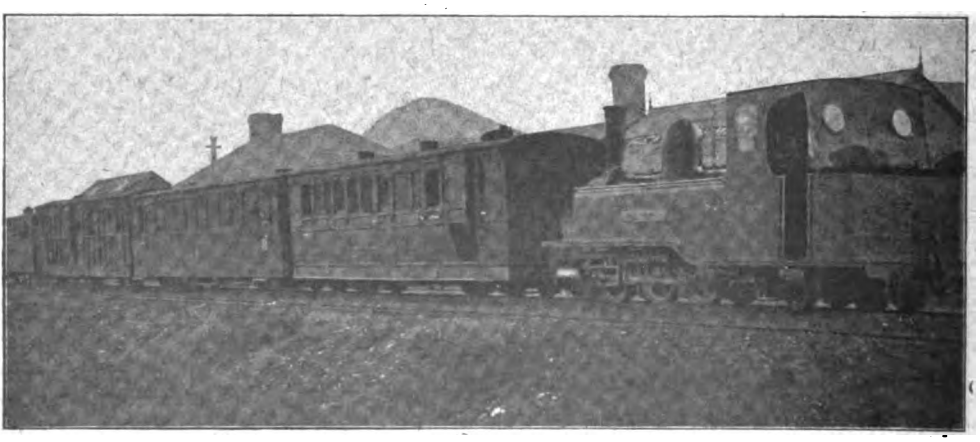
Junction, a station on the Carnarvon and Afon Wen section of the London and North Western Railway, to Snowdon. At the Rhyd-ddu terminus, 9¾ miles from Dinas, the line is within three miles of the mountain summit, and until the opening in 1896 of the Snowdon Mountain Tramroad from Llanberis, the North Wales Narrow Gauge Railway formed the nearest approach by rail to the summit. There is also a branch line from Tryfan Junction to Bryngwyn, used principally for the carriage of slates, the length of the system totalling 12 miles 34 chains of single line.



The company was authorised on August 6th, 1872, to construct two railways—one from a junction with the Portmadoc, Croesor and Beddgelert Railway to Bettws-y-Coed (23 miles), and another from Llanwnda to Bryngwyn and Rhyd-ddu (12¾ miles). The first-named scheme was abandoned, but the second one survived, the main line from Dinas to the west end of Quellyn Lake, and the branch from Tryfan to Bryngwyn Slate Quarries both being opened in June, 1877. Passenger traffic started in the following August, and the main line was completed to Rhyd-ddu (Snowdon) in May, 1881. In 1885 an Act was obtained to extend the railway to Carnarvon Harbour, but the work was never carried out, and the powers have since lapsed.

Subsequently, the line was continued in another direction—from Rhyd-ddu to Beddgelert (4¾ miles)—under powers given in 1901 to another company—the Portmadoc,



Photo] [*Locomotive Publishing Co., Ltd.*

NORTH WALES NARROW GAUGE RAILWAY.
Train at Snowdon station. 0-6-4 locomotive, *Moel Tryfan*.
All the rolling stock is fitted with the Westinghouse Brake.

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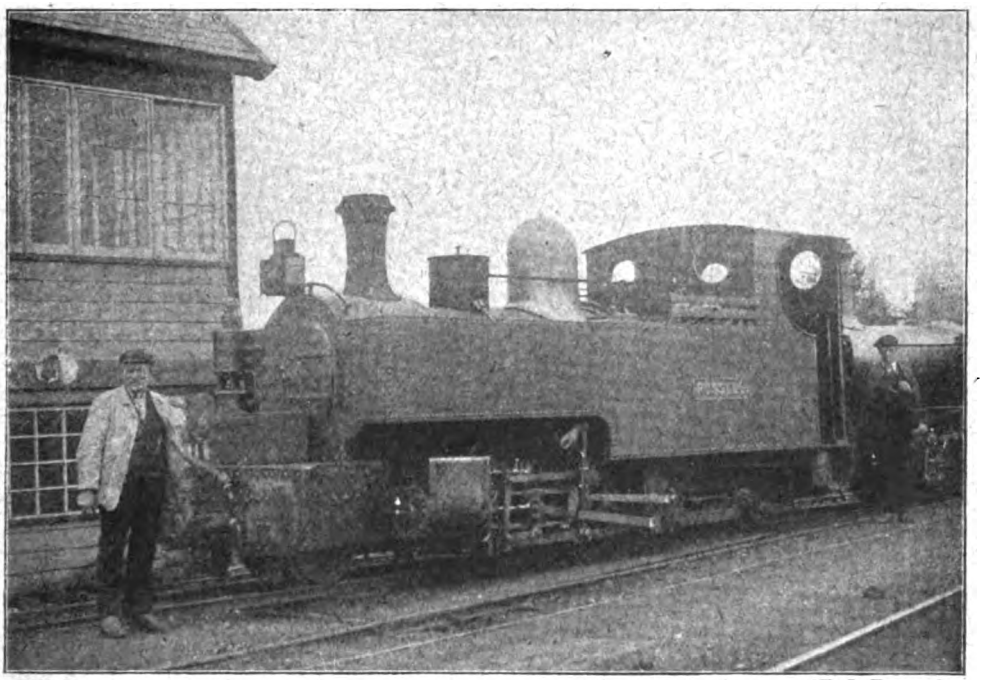
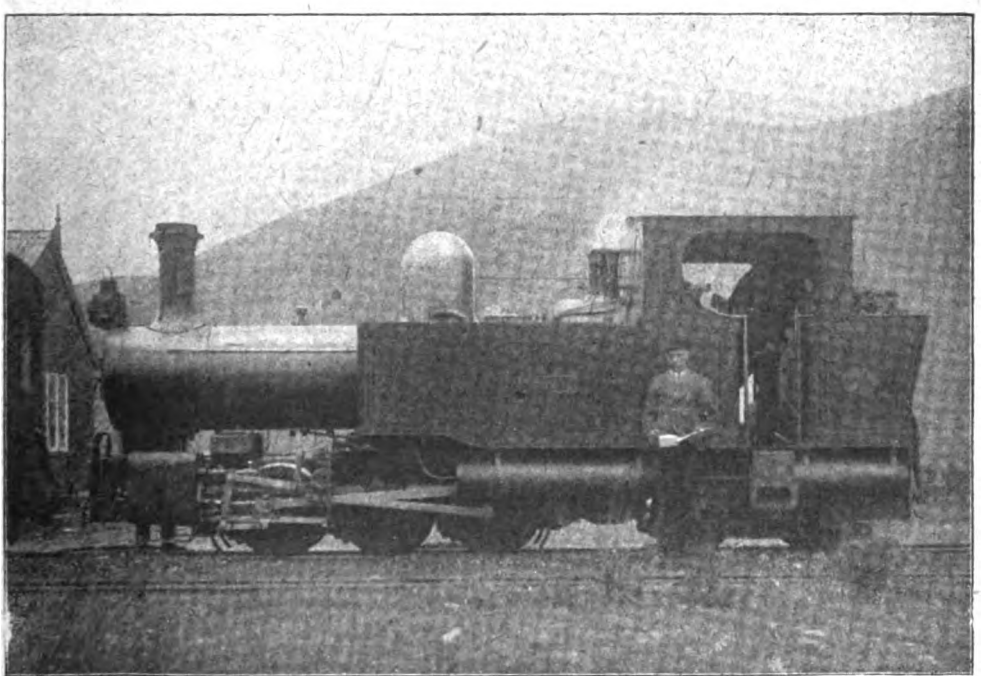


Photo] [H. L. Hopwood.

NORTH WALES NARROW GAUGE RAILWAY.
2–6–2 locomotive, *Russell.*
Built by the Hunslet Engine Co., Ltd., Leeds.



Photo] [H. L. Hopwood.

NORTH WALES NARROW GAUGE RAILWAY.
0–6–4 Fairlie locomotive, *Gourie.*
Built by the Hunslet Engine Co., Ltd., Leeds.

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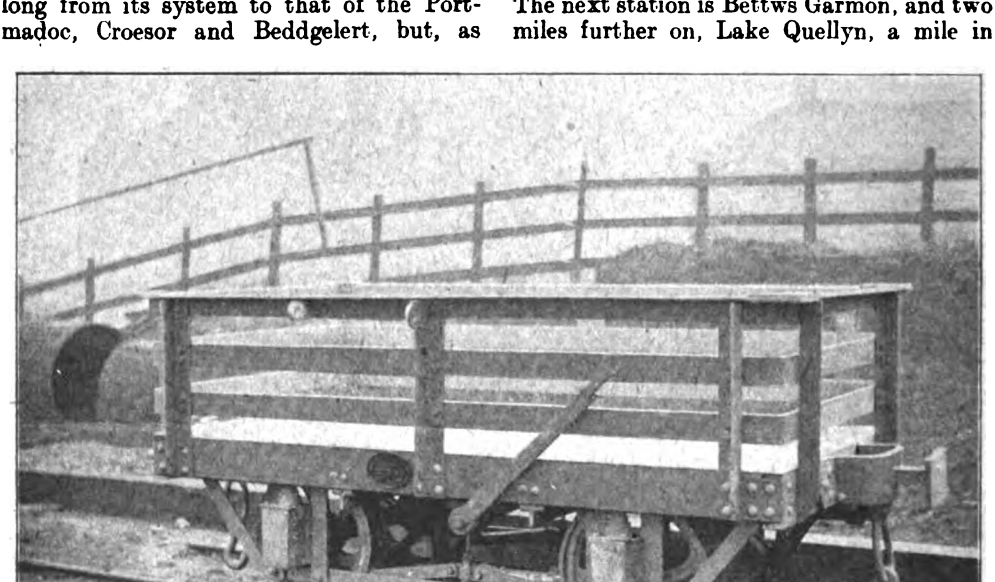
Beddgelert and South Snowdon Railway, which is under the same management as that of the North Wales Narrow Gauge Railway; and in 1904 the former company acquired the Portmadoc, Croesor and Beddgelert Railway, a mineral line of 1 ft. 11½ in. gauge, opened in 1864 and worked by animal power. Had the original project of the Portmadoc, Beddgelert, and South Snowdon been carried out in its entirety, the North Wales Narrow Gauge Railway would have obtained access to the coast at Portmadoc by means of a connection 12¾ miles long from its system to that of the Portmadoc, Croesor and Beddgelert, but, as already mentioned, only a portion (from Rhyd-ddu to Beddgelert) of the Portmadoc, Beddgelert, and South Snowdon Railway's missing link was constructed, and this has never been opened for traffic. It was intended to consolidate the three railways, and to work them by electricity, but the scheme has been in abeyance for some time, and at present the North Wales Narrow Gauge is still an independent company.



NORTH WALES NARROW GAUGE RAILWAY.
4-wheeled slate wagon.
The railway owns 147 wagons, chiefly employed in slate traffic.

Starting at Dinas, the railway for the first two miles or so runs through open country, and at Tryfan Junction, the first intermediate station, the branch to Bryngwyn diverges on the right. Bryngwyn is 2½ miles from the junction, and the branch, which rises almost continuously at gradients of 1 in 39 and 48, is continued past the passenger station for about ¾ mile to the quarries of the Alexandra Slate Mining Company, this section being used for mineral traffic only. Continuing along the main line past Tryfan, the character of the surrounding country soon changes, and vast mountain ranges are seen towering above the railway on either side. At Waenfawr, the main road from Carnarvon to Beddgelert comes into view and runs parallel with the railway the whole way. The next station is Bettws Garmon, and two miles further on, Lake Quellyn, a mile in length, is seen on the right hand side, both the road and the railway running close to its shores. At the eastern end of the lake is Lake Quellyn station, and a run of another two miles brings us to the Rhyd-ddu terminus, from the platform of which an extensive panorama of mountain scenery is observed, the summit of Snowdon, three miles to the east, standing out prominently above the other peaks. Rhyd-ddu station is over 600 ft. above sea level, and in its journey from Dinas the train has climbed nearly 400 ft., the average gradient being 1 in 65. Between Dinas and Tryfan there are 2¼ miles rising at 1 in 47.

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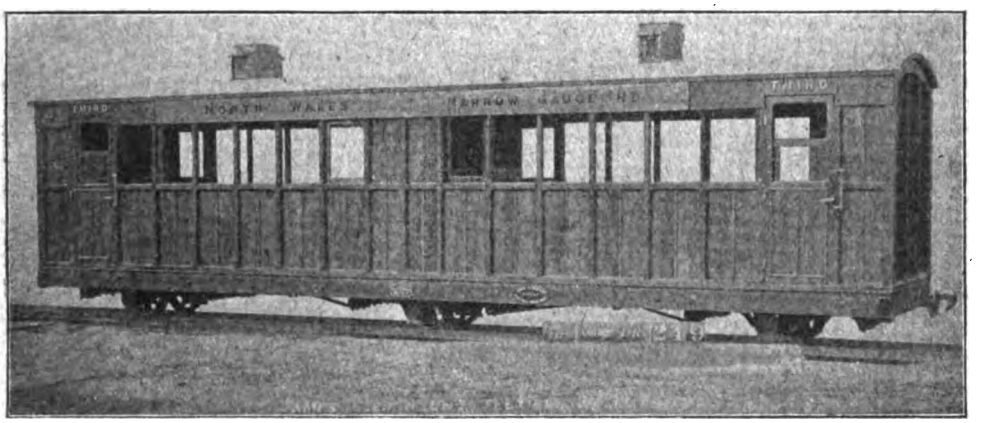

NORTH WALES NARROW GAUGE RAILWAY.
Original type of carriage built 1877; fitted with Cleminson's flexible wheelbase arrangement. Length of body, 30 ft.; wheelbase, 23 ft.; carrying capacity, 42 passengers; weight, 4¼ tons. The modern carriages, which number 16, are carried on four-wheeled bogies. The latest are 30 ft. in length and seat three passengers aside in the first class and four aside in the third class.

Originally, a considerable sum was spent on the construction of the railway, stone-built stations being the rule, and the signalling of the line was elaborate; although at the time of our visit the signals were out of use. For some years the affairs of the company have been in the hands of a Receiver, and gradually the passenger service has been restricted, until towards the close of 1916 it was entirely suspended—presumably for the duration of war only. The Bryngwyn branch was closed for passenger traffic at the end of 1913, and in the summer of 1914, before war was declared, there were only three trains a day each way on the main line, and these were withdrawn at the end of October, 1916.

The locomotive stock totals four engines, divided into three classes. All have six-coupled wheels, and three engines are of the Fairlie single-boiler type. Two of the latter—the *Snowdon Ranger* and *Moel Tryfan*—were built by the Vulcan Foundry Company in 1877, and were rebuilt by Messrs. Davies & Metcalfe in 1902 and 1903 respectively. These two engines are driven by six-coupled disc wheels placed in a bogie frame under the leading end of the engine; this bogie carries the cylinders and motion, and is pivoted on to a saddle plate which is securely fastened to the boiler barrel. The trailing end of the engine is supported by an ordinary four-wheeled bogie which also has disc wheels.

In 1906 the Hunslet Engine Company delivered the *Russell* (Works No. 901), an engine of entirely different type from the foregoing, having the 2–6–2 wheel arrangement, and slide valves operated by Walschaert's gear. Another new feature was the cylindrical sand-box mounted on the boiler barrel.

A further engine was built by the Hunslet Engine Company in 1908, and bore the name *Gowrie* (Works No. 979). In this case, the Fairlie type was reverted to, and while the engine was similar in general design to the *Snowdon Ranger* class, its appearance was very different. The Walschaert valve gear introduced in the *Russell* was perpetuated in the *Gowrie*, but the cylindrical sand-box was not retained. The engines are painted red, lined out with black and yellow lines, whilst the dome covers are of brass. The following table gives the dimensions of the three classes:—

Engines.	*Snowdon Ranger. Moel Tryfan.*	*Russell.*	*Gowrie.*
Cylinders (in.)	8½ by 14	10¾ by 15	9½ by 14
Wheels, diam. of driving (in.)	30	28	28
,, ,, carrying (in.)	19	18	22
Wheelbase, total (ft. and in.)	14 11½	15 6	14 0
Heating surface (sq. ft.)	366	381	282
Grate area (sq. ft.)	5·9	6·25	5·0
Working pressure (lbs.)	160	160	160
Water capacity (galls.)	350	440	400
Weight, total (tons and cwts.)	14 0	19 16	18 10

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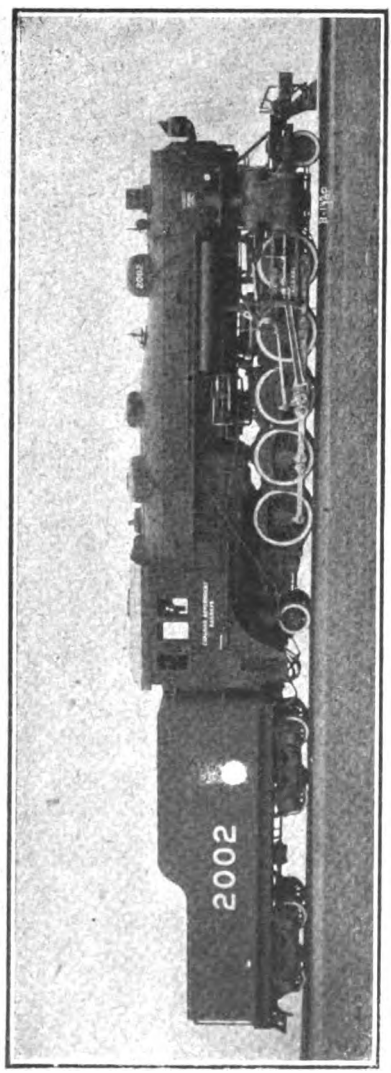
Canadian Government Railways:

NEW LOCOMOTIVE TYPE.

MUCH attention has been directed in the North American Continent to the ten 2–10–2 type locomotives recently put into service on the Intercolonial Division of the Canadian Government Railways.

Trains loads having outgrown the capacity of the Mikado type, the 2–10–2 locomotive becomes its logical successor in the same way that the Mikado type followed the Consolidation.



2–10–2 LOCOMOTIVE: CANADIAN GOVERNMENT RAILWAYS, INTERCOLONIAL DIVISION.

The 2–10–2 type has formerly been handicapped by its long rigid wheel base. The application of lateral motion driving axles and boxes to the first pair of drivers was made for the purpose of reducing the rigid wheel base to that which is in common use on locomotives of smaller capacity and securing the advantages of the 10-coupled wheel arrangement with the resulting increased capacity of the locomotive.

The lateral box arrangement consists of two independent driving boxes, whose traverse lateral centres are about on a line with the inside of the main engine frames. These two driving boxes are held in a fixed relation to each other by a bridge or spacing member which engages the inner flanges of the boxes. The weight which is transmitted through this bridge member is applied to the boxes on their transverse centres. The lugs on the spacing member which engage the inner flanges of the boxes are for the sole purpose of maintaining the proper spacing of the boxes and do not transfer any vertical load. The driving springs are in about the normal position, and are carried upon a cross member which has a vertical movement only between the engine frames, a wearing shoe being placed upon the inner side of the main frames to prevent side motion. Between this cross member and the bridge or spacing member above-mentioned, are interposed two inverted rockers designed so that a lateral force equal to 20 per cent. of the vertical weight transmitted is required to deflect them from their normal position.

When the boxes are deflected by a side movement of the first pair of driving wheels from their normal central position, the boxes and the bridge casting are moved laterally in reference to the member carrying the springs. This movement deflects the inverted rockers which offer a definite resistance against the motion. It will be noted that the spring and equaliser work is not shifted from its normal position when the boxes are deflected laterally. It will be seen from the illustration that one side of the bridge member is carried down below the driving axle with a bolting flange. This is provided for the attachment of a finger to guide the brake beam and insure that the brake heads register properly with tyres on first driver.

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CANADIAN PACIFIC RAILWAY EUROPEAN MANAGER.

By courtesy] *[The Canadian Gazette.*

LIEUT.-COL. GEO. McLAREN BROWN, the well-known European Manager of the Canadian Pacific Railway, was born in Ontario in 1865. Educated at Shrewsbury (England), Hamilton Grammar School, and Upper Canada College, he in 1881 entered the services of the Northern and North Western Railway, Hamilton, transferring three years later to the Grand Trunk Railway. In 1887 he was appointed Agent for the Canadian Pacific Railway at Vancouver, promoted five years later to be Assistant General Passenger Agent, Western Division, and subsequently became in turn Executive Agent, Superintendent of Hotels and Dining and Sleeping Car Department, and General Passenger Agent, Canadian Pacific Railway Atlantic Steamship Lines. In 1908 he became General European Traffic Agent, and in 1910 General European Manager with head offices at 62-65, Charing Cross, London. A special feature of Lieut.-Col. Brown's war activities has been his chairmanship of the Queen's Canadian Military Hospital, Beachborough Park. Recently he was appointed Assistant Director (unpaid) at the War Office.

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The Working of Single Lines of Railway in Great Britain.

By C. H. PALMER.

WHEN the block system came to be used extensively in this country, it was felt that additional safeguards were necessary for single lines. Five systems are in general use on British railways, viz. :—

1. The ordinary staff system.
2. The staff and ticket system.
3. The electric staff system.
4. The electric tablet system.
5. The Sykes interlocking system.

The first four systems differ from double line working in that a token (a staff, ticket or tablet) is given to the engine driver as his authority to proceed, and he does not have to rely simply on signals. The fifth method, devised by the Sykes Interlocking Signal Co., dispenses with tokens. It is used, at present, on the Glasgow and South Western Railway, the North British Railway (Lothian lines) and the Battersea Park to Victoria Carriage Road, London, Brighton and South Coast Railway.

1. The ordinary staff system. A piece of wood, called the staff, is given to the driver ; this is his sole authority to proceed. As there is only one staff, only one train may be on the single line section at one time, and block instruments are not necessary. Two engines may travel coupled together ; the first driver is shown the staff, while the second carries it. If there are any sidings in a section, the siding points are unlocked by a key attached to the staff, and when the points are thus unlocked, the staff cannot be withdrawn from the lock. Thus signals can be dispensed with, for the trainmen must restore the points to their normal position in order to release the staff and proceed on their journey. At terminal stations, however, it is often found convenient to have signals, though they are not really necessary.

2. The staff and ticket system. The ordinary staff system works well when there is a shuttle service of trains working to and fro. But, if one train is to follow another it is useless. Therefore the staff and ticket system is used. At each end of a single line section AB, there are two locked boxes in the charge of the stationmaster or signalman. These boxes contain a series of tickets. The key which opens the boxes forms part of the staff. There are two trains at A waiting to proceed to B. The stationmaster at A unlocks the box, fills up a ticket and signs it, shows the first driver the staff and gives him the ticket ; the second driver carries the staff. B cannot unlock his ticket box until he has the staff, so no train can leave B for A until the staff has arrived at B, as the staff cannot be at both ends of a section at once, two trains cannot approach each other on the single line section. Each ticket can only be used once ; the locks of the ticket boxes are so devised that the staff cannot be withdrawn until the box has been locked, and a driver who carries a ticket is strictly enjoined not to proceed without actually seeing the staff. If there are continuous sections of single line, the staffs are shaped differently and the locks of the ticket boxes are different, so that the right staff unlocks the right box. The names of the staff stations are stamped on the staff and printed on the tickets.

To prevent one train overtaking another travelling in the same direction, block instruments are provided as on double lines (though in light railway working a telephone is considered sufficient). On the Great Eastern Railway block sections are usually provided between the staff stations.

AD is a stretch of single line divided into staff sections AB, BC and CD. AB is subdivided into four block sections A to 1 ; 1 to 2, 2 to 3, 3 to B. BC is sub-divided into three block sections, B to 4, 4 to 5, 5 to C, while CD has no intermediate block sections at all, but is a block section in itself as well as being a staff section. At these intermediate block stations there is one platform road and sidings, with the usual signals in each direction. Most staff stations are passing places and are fitted up like ordinary double line stations, though at some staff

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stations where there is only one platform road, one train shunts on to a loop or siding for the other. Some companies, at such stations, insist that two passenger trains must not cross; only a passenger and a goods train or two goods trains. If two trains approach a staff station at once, the home signals for both directions must be kept at danger. When the first train arrives it is stopped at the home signal and then allowed to draw up at the platform. When this has been done the signals can be lowered for the train coming in the reverse direction.

Sometimes the staff is interlocked with the signals, so that they cannot be lowered unless the staff is at the station.

Intermediate sidings are usually unlocked by the staff (though at intermediate block stations the siding points are protected by the signals). This is impossible if the train wishing to use the siding carries a ticket, so signals are sometimes provided, worked from a ground frame and always lowered except when the siding is being used. But it is more usual to arrange that a train wishing to use a siding should carry the staff.

When a train approaches a junction, there is usually a code of whistles arranged so that the signalman may know whether the train carries the staff or a ticket.

3. The electric train staff system. This has been in constant use since 1889. The instruments are made by the Railway Signal Company, of Fazerkerley, and are known as the Webb and Thomson electric staff instruments. The principle of working is that, on a single line section AB, there is an instrument in the signal box at A and another at B, in electrical connection with each other. If a train wishes to proceed from A to B, the signalman at A obtains permission from B, by means of a bell code, to release a staff from the instrument at A. This staff is given to the driver, and no other staff can be taken out of either instrument (as the taking out of a staff locks both instruments). So no train can enter the section from either end, if there is a train already on it, as all trains must carry a staff. This system is effective, therefore, both in preventing trains meeting and overtaking each other, and so additional block instruments are not necessary.

As all trains carry a staff, intermediate sidings are best worked by a key attached to the staff, signals being dispensed with, though some companies, as the London, Brighton and South Coast Railway, prefer to use signals at intermediate sidings. As regards passing stations, what has been said about them under staff and ticket working is equally applicable under electric staff working. The Great Western use dummy distant signals on their single lines, which always remain at danger, except when they protect level crossings. Some staff stations are only used as block posts, where there is no accommodation for trains to pass, and the signalman must take care that two trains do not approach from opposite directions at once.

When two engines are coupled together the second carries the staff. In the case of banking engines, the Railway Signal Company has devised a special mode of working. The staff is obtained in the usual way and then inserted in a supplementary instrument, which releases another staff called the banking staff, which is given to the driver of the banking engine. No other staff can be obtained until both the banking engine has returned with the banking staff to the station whence it set out and the banking staff inserted in its instrument, and the ordinary staff has been inserted in the staff instrument at the other end of the section.

The staff instruments and staves are shaped slightly differently, so that on continuous stretches of single line, the staves, by mistake, cannot be inserted in the wrong instruments. Sometimes an intermediate staff station is switched out when traffic is not heavy, such as at night time or on Sundays. In such cases, a different set of instruments is used on the long section, which differs from the two sets of instruments for the two short sections. On the Great Western's Chard branch for the two short sections Creech Junction to Hatch and Hatch to Ilminster, staves are used, but, to avoid confusion, Tyer's electric tablets (which I will shortly describe) are used for the long section Creech Junction to Ilminster when Hatch is switched out.

On the Garstang and Knott End Railway there are no operators at all on the staff sections, but the Railway Signal Company have cleverly devised an automatic operating instrument by which the staff can be obtained.

When a staff has been brought by a train to the end of a section, it must always be inserted in the staff instrument and permission obtained in the usual way for it to be taken out again, even if a train is waiting to proceed at once. When the signal box is some way from the station this is awkward, and an instrument has been devised to do

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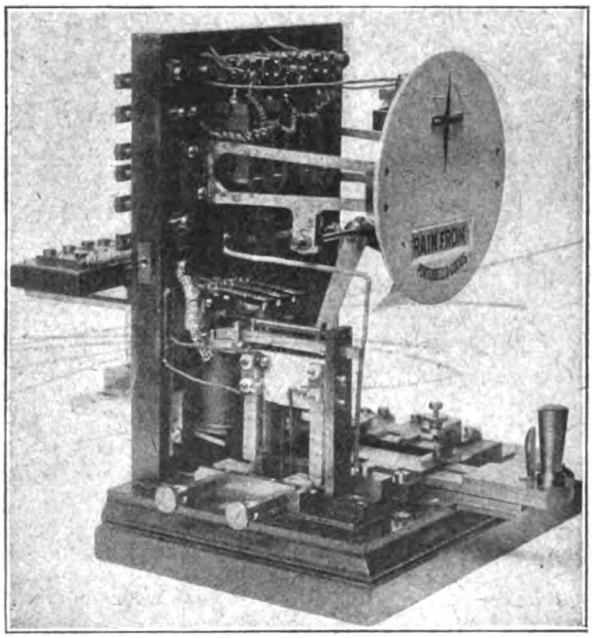
SYKES' SINGLE LINE INSTRUMENT. NORTH BRITISH RAILWAY (LOTHIAN LINES).



SLIDE IN "IN" POSITION INDICATING TRAIN APPROACHING.
(Case removed.)

SLIDE IN "IN" POSITION INDICATING TRAIN APPROACHING.
(Case on.)

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this more effectively, as at St. Erth station on the Great Western Railway. One of the station men takes the staff from the driver and inserts it in a special instrument in a ground frame on the platform, the staff is locked in the instrument and cannot be released until the signalmen both at St. Erth and Marazion (the station at the other end of the section) have given their permission.

When too many staves accumulate in one instrument, the linesman, taking stringent precautions, unlocks one instrument and transfers some of the staves contained therein to the instrument at the other end of the section. A magazine has been devised to transport them.

If the staff instruments break down, a pilotman must travel on the engines until they are in working order again. Or a pilotman's staff is sometimes used which is so interlocked with the staff instruments that, even when they are in working order again, they cannot be used as long as the pilotman's staff is out.

4. The electric tablet system. This is the property of Messrs. Tyer & Co., Dalston and Carlisle, and the principle is exactly the same as the principle of the electric train staff. The tablets are small, circular discs of metal, and to be handled more easily they are put in leather pouches which have a loop attached.

It is unnecessary to go into great detail about tablet working, as what I have said about the electric staff applies to the tablet. To open intermediate siding points the tablet is inserted in a slide from which it cannot be withdrawn until the points have been restored to their normal position.

But Messrs. Tyer have a special device known as the occupation key for certain sidings. (It is also used for the Dungeness branch of the South Eastern and Chatham Railway.) The train wishing to use the siding does not carry a tablet, but the occupation key. When the key is in use no tablet can be released at either end of the section. But as soon as the train has entered the siding and the points restored for main line working, the tablet instruments are brought into use again and the line restored for normal traffic.

5. The Sykes Interlocking Signal Company have devised a system for dispensing with staff or tablet, which is used on the Glasgow and South Western Railway, North British Railway, and London, Brighton and South Coast Railway. The principle is: Suppose a train has been given permission to travel from A to B—a single line section. When A has got this permission on the special Sykes instrument, B's signal lever is locked and he cannot lower it for a train to enter the section at B. Also, when the train has left A it passes over an electric treadle which puts the starting signal at A to danger, so that the section is entirely closed at both ends while the train is in the section. Two illustrations have been given to show the working of this.

As regards other systems in use in Great Britain, the District, to work a small portion of their Hounslow branch, use a track circuiting system, dispensing with staff or tablet.

Sometimes one set of rails on a double line is closed, for instance, by reason of an accident or for permanent way purposes. In this case a pilotman usually travels on the engine, but if two trains follow each other, the first carries a ticket signed by the pilotman as in staff and ticket working.

As regards the exchange of staff or tablet at speed, this is still done to a large extent by hand, which necessitates slowing down. The Great Western Railway have an apparatus which enables the staff to be exchanged at 15 miles per hour. The staff is fitted with a ring and inserted into a socket in a post by the side of the rails. The staff is dropped on to a dummy arm fixed to a post. This dummy arm can also be used in tablet working for dropping the tablet.

Mr. Whitaker, formerly Locomotive Superintendent of the Somerset and Dorset Joint Railway, devised a scheme for the exchange of tablets up to 60 miles per hour. It could also be used with the new miniature 8-in. electric staves which have lately been brought into use. The tablet or staff to be picked up is put into a pouch, which is fastened to a post on the side of the track. From the tender there is a bar on the end of which is a jaw which picks up the pouch, containing the staff or tablet, by a loop. The tablet to be dropped is placed in a pouch which is held in a holder above the jaw which is to receive the new tablet. The old tablet is received by a jaw fastened to the post at the side of the track to which the new tablet is attached. The dropping of the old and the picking up of the new tablet takes place simultaneously, and immediately the instrument swings round at a right angle clear of the train. (At Templecombe, where it stands in the six-foot way, it falls to the ground.)

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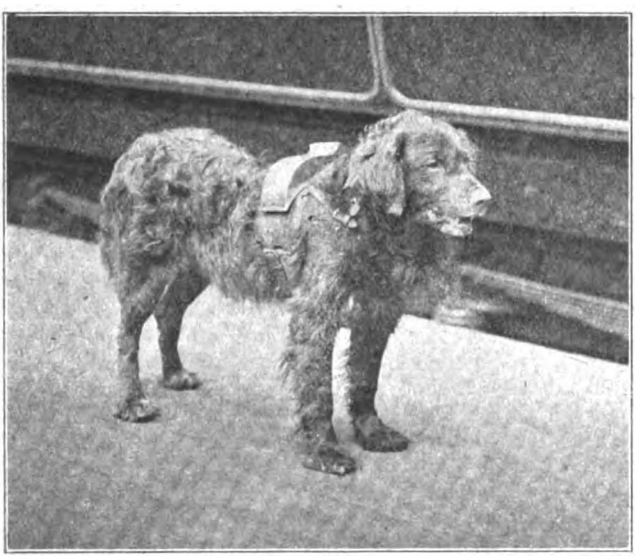
As regards what system is the best to use, the ordinary staff system, with one engine in steam, is inexpensive and easy to work where there is a short branch with a shuttle service of trains. Where this is impossible, the staff and ticket system is inexpensive, but there is the disadvantage that the staff may, by the error of a signalman, be at one end of a section when it is wanted at the other, and there is the further disadvantage that a train with a ticket cannot use an intermediate siding unless signals are provided, which is not always done. The electric staff and tablet systems, therefore, seem the best, though we wonder that the Sykes system is not used more to obviate the difficulty of exchange at speed. We also think that where staff or tablet is used, hand changing, except at stations where the train has to stop, should be abolished, as it involves risk of injury to the men engaged and necessitates the train slowing down.

A WELL-KNOWN FIGURE AT EUSTON.

SEVEN years ago Brum II., the collecting dog at Euston Station, London, began his campaign on behalf of the London and North Western Railway Servants' Benevolent Fund, and we are informed that by his efforts £1,500 has now been raised. Their Majesties the King and Queen, Princess Mary and many members of the Royal Family have patronised the dog when at the terminus, and he is a favourite with all travellers using this "gateway to the North." In 1910, when he had collected his first £100, the wife of the then General Manager (the late Sir Frank Ree) presented Brum with a medal, and now, upon his having succeeded in raising £1,500 for the fund, a second medal has kindly been subscribed by Mrs. Calthrop, the wife of the present General Manager, Mr. Guy Calthrop, who for the time being is filling the important position of Controller of Coal Mines. Although Brum is no longer quite so active as in the past, he may still be seen trotting along the platforms at Euston and pushing his way into compartments to receive in his box whatever the kind-hearted traveller may be disposed to give. RAILWAY MAGAZINE readers will join in the hope that he may long continue to collect for so worthy an object.



A CANINE COLLECTOR OF COIN FROM THE CHARITABLE.

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British Railway Service and the War. [XV.]

PUBLIC recognition of the business capabilities of British railway officers is becoming a fixed feature in recording the progress of the war service rendered by the British railway industry. Thus the day after the publication of the June RAILWAY MAGAZINE it was officially notified that as the problems connected with the supply of timber now had only an indirect connection with the War Office, the War Cabinet had decided that it was advisable to transfer the Timber Supply Department from the War Office to the Board of Trade. A separate department had been established for the control of all timber, and Mr. James B. Ball, M.Inst.C.E., engineer-in-chief London, Brighton and South Coast Railway, whose services had been placed at the disposal of the Government, had been appointed by the Board to take charge with the title of Controller of Timber Supply. Mr. Ball's portrait and biography appeared in the RAILWAY MAGAZINE, April, 1917, on pages 248 and 249.

By an arrangement with the Mersey Docks and Harbour Board, the Shipping Controller has appointed Mr. L. A. P. Warner to take charge of the department of the Ministry of Shipping responsible for port work and the development of the ports. The question of facilities at the southern and western ports is among the matters to which special attention is being given. Mr. Warner will work in close touch with the Royal Commission on Wheat Supplies, the Railway Executive, and other bodies concerned. Mr. Warner was formerly in the service of the London and North Western Railway.

Regarding the constitution of the Admiralty Department under Vice-Admiral Sir Eric Geddes as Controller, the Secretary of the Admiralty makes the following announcement. As indicated in the preliminary notice given by the First Lord of the Admiralty in the House of Commons on May 14th, the Controller is responsible for meeting the combined requirements of the Admiralty, the War Office, the Ministry of Shipping, and other Government departments in respect of the design, construction, alterations, and repairs of warships and other vessels of all classes, and the requirements of the Admiralty in respect of armaments and munitions. As RAILWAY MAGAZINE readers are aware Sir Eric Geddes is an officer of the North Eastern Railway and it is not surprising therefore that Sir Vincent L. Raven, Chief Superintendent of Ordnance Factories, has been made Deputy-Controller for Armament Production. He is responsible to the Controller for all matters pertaining to the manufacture and purchase of ordnance, etc., matériel, torpedo and mine, etc., matériel. In railway life Sir Vincent is chief mechanical engineer of the North Eastern Railway.

A recent supplement of *The London Gazette* records that Mr. John Henry Follows has been given the rank of Major, Corps of Royal Engineers. Mr. Follows is the Acting General Superintendent of the Midland Railway and his portrait appeared in the RAILWAY MAGAZINE, April, 1917, on page 283.

Other Midland Railway recent military appointments are :—

Mr. Henry Bardill Buckle, who was previously in charge of the chief mechanical engineer's department at Sheffield, and was also in charge of the locomotive shed at Millhouse, second lieutenant, Royal Engineers.

Mr. James Cecil Foster, who was previously in the chief mechanical engineer's department as a privileged apprentice, went to the Ministry of Munitions as a draughtsman, and afterwards passed through the usual course of training in the locomotive sheds at Derby, second lieutenant, Royal Engineers.

Mr. A. W. Rogerson, who was an apprentice at the Kentish Town locomotive depôt, and latterly in charge of the motive power depôt at Derby, second lieutenant, Royal Engineers. He is the son of the late Mr. A. Rogerson, who was the Midland Railway veterinary surgeon for the London district.

Mr. H. F. Shepherd, who was foreman at the motive power shed, Derby, has been promoted from warrant officer to second lieutenant, Royal Engineers.

Mr. Herbert Rihill, second lieutenant, Royal Engineers, served his time as privileged apprentice on the London, Tilbury and Southend section, at the locomotive works, Plaistow, and was subsequently appointed sub-inspector on that section. In 1915 he was appointed district locomotive superintendent's assistant at the Midland Railway Kentish Town locomotive depôt.

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Mr. James Humphries entered the locomotive shops at Derby as apprentice in 1906. He was appointed locomotive foreman at Mansfield in 1913, and was subsequently district locomotive superintendent's assistant at Nottingham motive power depôt. He acted as district locomotive superintendent at Toton from October, 1914, until he enlisted as a private in the Mechanical Transport Section in November, 1916. From this grade he has been granted a commission as second lieutenant in the Railway Operating Division of the Royal Engineers.

To soldiers who in railway life were employed on the Great Western a number of Military Medals have been bestowed, and from the accounts furnished they have been well-earned, as the following record amply demonstrates :—

Corporal H. T. G. Miller, Signal Section of the Royal Engineers (a clerk in the divisional superintendent's office at Bristol) was in charge of the advanced report centre when a heavy bombardment of the locality, which was quite unprotected against shell fire, was opened. He received orders to remain at his post as long as possible, but was to vacate it if the shelling became too intense, which it did. He, nevertheless, remained on duty at the post for two hours longer, under a heavy bombardment, enabling communications to be maintained until an alternative line had been laid. He then ordered his men to withdraw, but himself remained to disconnect the instrument.

Sergeant George Price, Shropshire Light Infantry (rail motor conductor at Garnant), has been similarly decorated for exceptional bravery whilst in charge of a bombing party in France. He is a native of Shrewsbury, and was popularly known in the Northern division before his transfer to South Wales.

Formerly a plumber's mate in the carriage department at Old Oak Common, but now serving in the Royal Berks Regiment, Private Howard Harry has likewise received the Military Medal for meritorious service in action.

For the heroism of her late husband the widow of Corporal Leonard Roberts (parcel clerk, Leominster station) has received the medal due to him for gallantry in the field. His brave conduct for which the medal was awarded took place some ten weeks or so before he made the supreme-sacrifice.

Quite a large number of Great Western Railway men have received Distinguished Conduct Medals.

Second Lieutenant Donald Kier Webster, of the Scottish Rifles, has died from wounds received in action. He enlisted in the Cameron Highlanders in December, 1914, being then on the staff of the Superintendent of the Line, Caledonian Railway. He was only 20 years of age.

Lieutenant Alexander Charles Oswald Mitchell, who was formerly in the General Manager's office of the Lancashire and Yorkshire Railway, has given his life for King and Country. He was 29 years of age, and had been educated at Charterhouse and Cambridge University. In the early days of the war he rendered important service in running troop trains over his section of the line, for which he received the special commendation of Lord Kitchener, who referred to his services in the phrase "Through to the minute." He was also thanked by the War Office.

No. 1584, Lance-Corporal H. J. Smith, R.A.M.C. (T.F.) writing from the Reception Station, Kasr-el-Nil Barracks, Cairo, says: "I should be very grateful if you would insert a notice in the RAILWAY MAGAZINE that if any RAILWAY MAGAZINE reader has any old copies to spare I should be much obliged if they would send me one or two. I used in pre-war days to be a regular subscriber to your excellent magazine, but I have found it impossible to obtain it in this country. I should be pleased to get a few copies to remind me of the railways in the old country. I should be prepared to remit the postage of any copies which might be sent me." Every month we mail the RAILWAY MAGAZINE to Egypt. Perhaps some of our readers in the land of the Pharaohs may be able to put the lance-corporal in the way of a sight of his favourite magazine.

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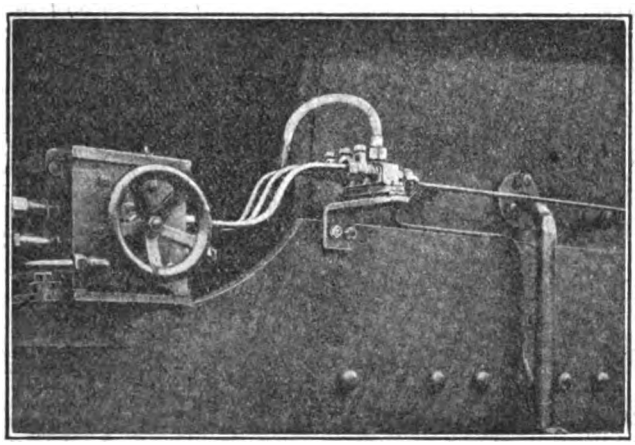
An Anti-Carbonising Device for Superheater Locomotives.

AN ADDITION TO THE WAKEFIELD MECHANICAL LUBRICATOR.

IT is essential to the proper working of a locomotive, and particularly one using superheated steam, that the steam distributing valves and pistons should be adequately lubricated, and the use of mechanical lubricating devices is regarded as a standard and indispensable feature of working in superheater engines. These lubricators are capable of being employed for any reasonable number of feeds, and the rate at which the oil is conveyed to the valves, cylinders, &c., can also be adjusted to meet varying requirements.

In spite of these refinements, however, it often transpires that locomotive drivers, through fear of under lubricating the parts of their engines, or for other cause, purposely adjust the lubricators so that an excess of oil is conveyed to the valves and pistons, and the result of this, as may be gathered, is seen in the carbonisation of the parts referred to. It has been found impossible to stop this practice on many railways and the only way of avoiding excessive wear due to such carbonisation is that of fitting a device by means of which the depositing of burnt oil on the hot dry surfaces of the valves and cylinders is avoided.

There would be no need for fitting any anti-carbonising device if the lower consumption of oil, sufficient for the needs of the engine were adhered to, provided that a high-grade oil is used, but in this matter the human element has to be taken into consideration, and the provision of the appliance has the effect of making the mechanical lubricator more fool-proof and at the same time nullifying the mischief created when the oil feeds are tampered with after being properly adjusted.



WAKEFIELD LUBRICATOR.
With Anti-Carboniser attached, as mounted on a locomotive.

The illustrations reproduced are from originals kindly supplied to the RAILWAY MAGAZINE by Messrs. C. C. Wakefield & Co., whose mechanical lubricator for superheater locomotives is nowadays regarded as a standard fitting both in this country and on many railways abroad. In exhaustive trials

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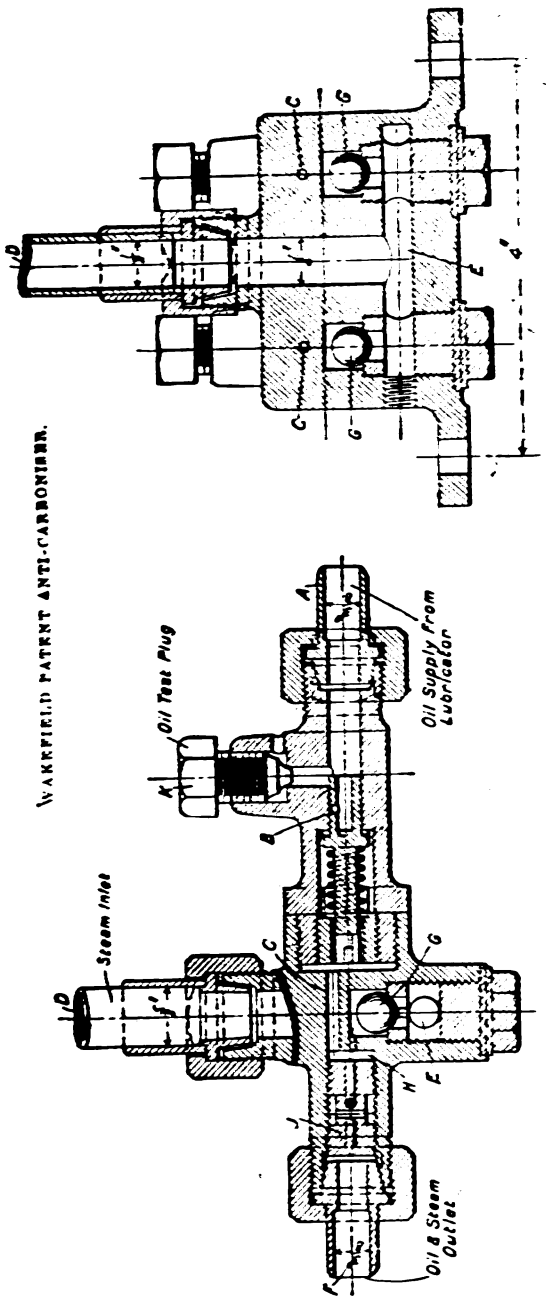
carried out with this anti-carbonising apparatus the most excellent results have been obtained, and reports are to hand showing that superheater locomotives have run for

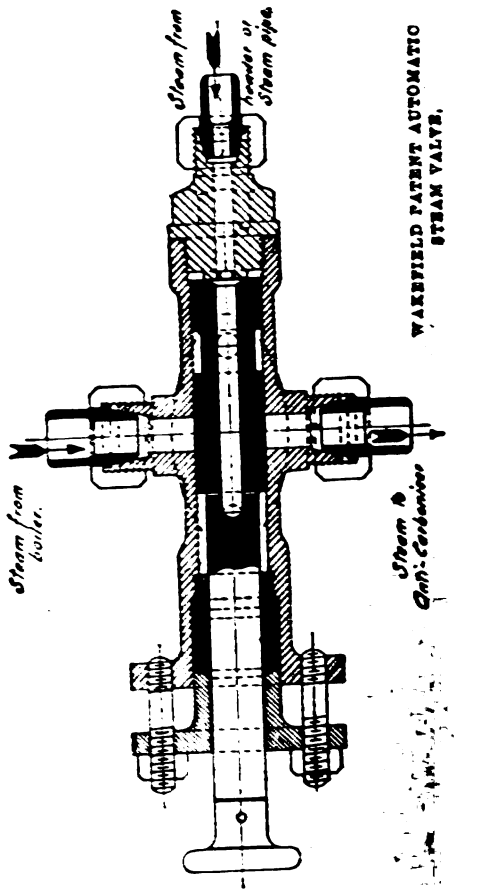


periods of six months and upwards without any necessity having arisen for cleaning the valves, pistons, steam chests or ports.

In the operation of the device, oil from the Wakefield's mechanical lubricator enters the anti-carboniser at A and is forced past the plunger check valve B and through the passage C, when it comes into contact with the steam jet.

Steam enters the anti-carboniser at D and branches along the passage E which communicates with each of the outlets F. A check ball valve is provided at G which prevents the oil and steam from traversing in a reverse direction.

It will be seen that the point of contact



of the oil and steam is in the small space or cavity H. The oil and steam together then pass through the baffle J and so to the outlet F.

The object of the baffle is to more thoroughly mix the oil and steam which would not, of course, so thoroughly mix were they merely to pass out through a plain hole.

The steam from the boiler, which enters the anti-carboniser at D, is controlled by the Wakefield patent automatic steam valve.

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This latter apparatus should preferably be fitted in the driver's cab, and is so constructed that it automatically opens and admits steam to the anti-carboniser immediately the driver opens the regulator.

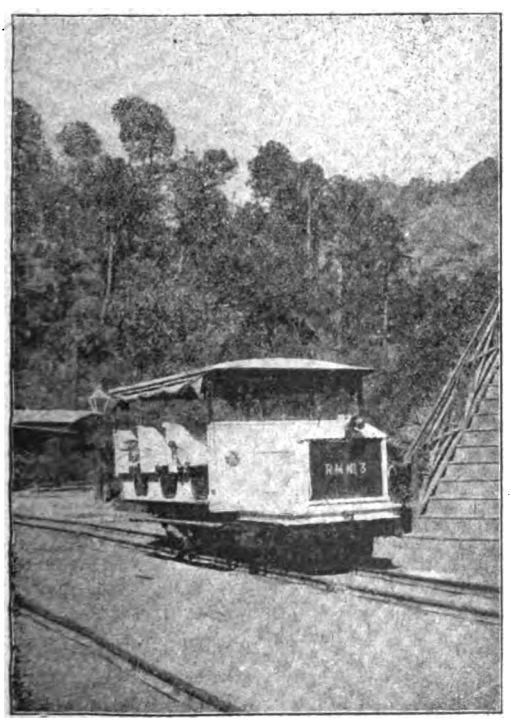
The valve does not, however, automatically close when the regulator is shut, as it is most important that steam should be blowing through to the anti-carboniser when the locomotive is drifting, as undoubtedly it is then when carbonisation is most likely to take place, if the oil, in its pure state, is forced on to the dry, hot surfaces without having the benefit of the scavenging effect of the steam.

The drawing shows a two-way anti-carboniser, but it is obvious that it can be made with any reasonable number of feeds.

The oil test plug shown at K is for the purpose of testing the oil flow from the mechanical lubricator.

The usual practice (assuming that a six-way anti-carboniser is required) is to fit a three-way anti-carboniser on each side of the locomotive. The steam from the automatic steam valve is carried in one pipe to a point just behind the front tube plate, where it divides, one branch leading to each anti-carboniser.

The apparatus described above has been fitted to a considerable number of locomotives in this country in conjunction with the Wakefield mechanical lubricator. Both the Great Eastern and Great Northern Railways are using it largely, whilst the London and North Western, Caledonian, North British and London, Brighton and South Coast Railways have each equipped some engines with the device experimentally. The device has also been tested on a number of railways abroad, and has given very satisfactory results.



An Indian Rail Motor Car.

CARS, similar to the one here illustrated from a photograph by Mr. F. Tosland, are in use during the hot weather season on the Kalka–Simla hill railway.

Each car has accommodation for ten passengers, and an extra charge of five rupees (six shillings and eightpence) is made for a seat in addition to the ordinary first-class fare.

Driven by petrol engines, the cars make only three stops on the journey and allow of an excellent view of the hill scenery. During the cold weather the service is withdrawn.

Mr. Tosland's photograph portrays one of the rail motor cars standing at Barogh station.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper right-hand corner. Questions relating to the names, numbers, dates, dimensions, etc., of locomotives should not be forwarded, neither should queries be of purely local interest. Before asking for information concerning railway history, leased and worked railways, electrically operated railways, rolling stock statistics, notable railway accidents, and the like, RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book" (2s. 6d. net), the twentieth annual Edition of which is on sale at the* RAILWAY MAGAZINE *Offices, 30, Fetter Lane, Fleet Street, London, E.C.4. By post in British Isles 2s. 11d., Abroad 3s.*

Great Western Railway Broad Gauge.

In consequence of the difference in gauge between the Great Western Railway and its allies, and those of other lines in Great Britain, difficulty was experienced in conducting through goods traffic between the broad and narrow gauge lines. The break of gauge made transhipment necessary. The trouble was much reduced by "mixing" the gauge, *i.e.*, adding a third line between the metals forming the 7 ft. gauge, and so adapting the railway for vehicles of both the 7 ft. and 4 ft. 8½ in. gauge. Mixed gauge was laid down over a large portion of the broad gauge lines, but gradually the various branches were converted to narrow gauge. The first important conversion took place in May, 1872, and was on the length of railway between Swindon and Gloucester and South Wales. In 1874 the mixed gauge was extended to Exeter, but below Exeter the main line to Falmouth, and most branches, were broad gauge only. Despite the admitted superiority of the broad gauge, the exigencies of traffic, and the additional expense of maintaining the mixed gauge, added to the comparatively small mileage wholly broad gauge, caused the Great Western Railway directors to entirely abolish the 7 ft. gauge and this was successfully done on May 21st and 22nd, 1892.

[Reply to A. CHANT AND OTHERS.]

Portsmouth Arms Station.

The origin of the name of this London and South Western Railway station between Yeoford Junction and Barnstaple proves on enquiry not quite so enveloped in mystery as might be imagined. It arises from the fact that the Earls of Portsmouth in former days owned much property in the neighbourhood, and there is in the proximity of the railway station the inevitable West Country inn. This particular house of public entertainment has long borne the sign or title of the "Portsmouth Arms." A local correspondent has kindly furnished the following facts:—

"About 60 years ago the property lying around this station belonged to the Portsmouth family, including the village of Burrington two miles distant. About 200 yards west of the station buildings there is an old inn called the "Portsmouth Arms" which was in existence prior to the building of the railway, so it is generally held that the "Name Selection Committee" had this fact in mind when choosing the name. At present there is no property near here held by the Portsmouth family, it having been sold years ago, but at the time the station was made (63 years ago) they were the largest property owners in the district."

[Reply to C. E. BEANES.]

Brecon and Merthyr Engine No. 46.

The design of the engine illustrated on page 403, June RAILWAY MAGAZINE, was based upon the 0–6–2 goods engines supplied to this railway by Messrs. R. Stephenson and Co., Ltd., which engines weigh, in working order, 68 tons, and each has 4 ft. 6 in. diameter coupled wheels, with 18½ in. cylinders.

Most of this company's engines have to work both mineral and passenger trains, over gradients as heavy as 1 in 38, working perhaps one short trip only with a colliery workmen's train or passenger train, and the remainder of the day's work hauling mineral trains. It was found that these locomotives were too small in the wheels and too sluggish in action to be quite satisfactory for passenger train work. In designing No. 46 many of the features were, however, retained, to make the working parts as interchangeable as possible. These engines have now been at work some time and have been found to be quite satisfactory, both on mineral and passenger train service.

[Reply to ARTHUR B. WHITE.]

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"Slotted" Signals.

In cases where the "distant" signal from one signal cabin is placed on the same post as the "starting" or "advanced starting" signal of the cabin next in rear (owing to the shortness of the block sections) it becomes necessary for the two arms to be "slotted," *i.e.*, for the starting or advanced starting signal arm to "control" the distant arm. This is in order to prevent the distant signal being pulled off while the arm above it remains at danger, or remaining off when the upper arm returns to the danger position, as under such conditions a driver might mistake the distant signal for the starter, and so run past the latter at danger. There are also other cases of "slotting," too numerous to enter into here, when it is desirable that more than one signal box shall control the same signal; instances even of treble slotting arrangements could be quoted.

[Reply to W. S. UPTON.]

Central London Railway.

Central London Railway motor cars now being used on the Bakerloo-Watford line were originally built to run on the Central London Railway, this system having a grounded return, the Bakerloo Railway has an insulated return, and it was therefore necessary to make certain electrical alterations to the equipment in order to run on the Watford line.

With regard to the arrangement of the railways on the Central London Extension to Ealing, we are not quite sure what information is required. The Great Western Railway is laying the permanent way and the conducter rail will be the same as on the Central London Railway.

Work has not been commenced on the Shepherd's Bush–Gunnersbury Extension on the Central London Railway and it will probably be some time before this extension is made.

[Reply to R. W. PEARSON.]

London and North Western Railway Locomotives.

Although "Claughton" class locomotives in latest series are not named, this is no criterion that the London and North Western Railway is abandoning the practice of naming locomotives. The new "Claughton" class nameless engines have not lost the opportunity of each receiving a distinguishing title. As the war progresses military nomenclature will doubtless be developed, and one of the new engines may some day be known as "Sir Douglas Haig." We shall see. Seven of the new batch of "Claughton" locomotives have been put into service. Nos. 37, 154 and 155 are at Rugby, and No. 713 at Edge Hill. At the moment of writing Nos. 186, 1334 and 2042 are on loan at Crewe, but by the time this is in print they may be elsewhere.

[Reply to H. A. WHITE.]

Late Mr. Adams, Locomotive Superintendent, London and South Western Railway.

Mr. E. L. Ahrons, the locomotive historian writes:—"Mr. Adams was born October 15th, 1823, and in his early years was engaged on marine work, and for some time was in the Sardinian Navy. From 1853 to 1873 he was locomotive, carriage and wagon superintendent of the North London Railway, and from July, 1873, until the beginning of 1878 he held a similar post on the Great Eastern Railway, when he joined the London and South Western Railway. It was early in 1878, for his first engine for the London and South Western Railway came out, built by Beyer Peacock and Co., at the end of 1878. He retired in July, 1895, on account of failing health, and died at 'Hillrise,' Putney, on August 7th, 1904, in his 81st year."

[Reply to F. W. SMITH.]

Dimensions of Boiler Tubes.

The term "W.G." is an abbreviation for "Wire Gauge," the best-known being "S.W.G.," or "Sheffield Wire Gauge," and "B.W.G.," or "Birmingham Wire Gauge." As their name implies, these gauges or templates were first introduced for the purpose of measuring and describing in convenient terms the variations in the diameter of wire without having recourse to minute fractions of an inch. Opinions differ considerably in the matter of tube heating surface, but for the purpose of the 15 in. gauge locomotive you mention, we should not recommend anything smaller than 1 in., or at the very lowest $\frac{7}{8}$ in., external diameter for the tubes. You could probably allow for about 40 tubes in a boiler of 18 in. diameter.

[Reply to C. T. HUTTON.]

"Atlantic" Locomotives, Lancashire and Yorkshire Railway.

We are not aware of any such radical change in the appearance of these locomotives as that to which you refer. What has probably given you this impression is that the new standard Lancashire and Yorkshire

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chimney for the large-boilered engines is of considerably greater diameter than those employed hitherto, and, being uniform for the 0–8–0, 4–6–0 and 4–4–2 classes, is shorter than those previously carried by the "Atlantics." This squat chimney has had the effect of modifying considerably the external appearance of the 4–4–2 engines, but beyond this they have had no important structural modification.

[Reply to REX LEATHLEY.]

American Locomotives.

American locomotives are invariably constructed with a running plate considerably higher off the ground than is customary in this country, clearing the driving wheels. Consequently no splashers are required. It is also usual in American cabs to have a front door on either side of the firebox, allowing the driver access to the running plate when the engine is in motion without the necessity of his getting round the outside of the cab. The more limited dimensions of our loading gauge would not allow of any such provision being made over here.

[Reply to J. PRITCHETT.]

Bolsover Tunnel.

This tunnel is on that piece of the Great Central Railway which was formerly an independent line, *viz.*, the Lancashire, Derbyshire and East Coast Railway. Being 1 mile 864 yards in length it ranks as one of the longest tunnels in Great Britain. Under the superintendence of the railway engineer, Mr. R. Elliott Cooper, the contractors for this section of the line, Messrs. S. Pearson and Son, constructed the tunnel in a shorter time than any other of equal length and size. For list of tunnels see "Railway Year Book," 1917, page 30.

[Reply to H. B. SHARPE.]

London Bridge, London, Brighton and South Coast Railway.

Main Line trains into London Bridge, London, Brighton and South Coast Railway, from the New Cross and Croydon direction can use either London, Brighton and South Coast metals throughout, running through South Bermondsey station, or South Eastern and Chatham Railway metals from Corbet's Lane Junction to London Bridge Junction, as may be most convenient from the standpoint of traffic operation.

[Reply to K. PATON.]

East Croydon Station.

East Croydon railway station is arranged as follows:—The extreme western platform No. 1, is the local platform—up and down. The centre one, No. 2, is the up main, and the one on the eastern side, No. 3, the down main. The actual main lines are those between Nos. 2 and 3 platforms, the roads on the other sides of these two platforms being known as the up and down loops respectively.

[Reply to K. PATON.]

King Edward VII. Railway Bridge, Newcastle-on-Tyne.

Formal opening of this bridge by the late King Edward was celebrated on July 10th, 1906 (see "Railway Year Book," 1917, pages 8 and 229), but the opening for public trains took place on October 1st, 1906, the first passenger conveying train being the 9.30 a.m., Newcastle to York. In the down direction the first train was the 9.38 a.m., York to Edinburgh.

[Reply to C. JACQUES.]

"The Best Permanent Way in the World."

You are wrong in assuming that the stretch of track depicted on the famous London and North Western Railway poster is that between Tring and Cheddington bank. This impression is a very common error, but as a matter of fact the scene is between Pinner and Watford. It represents the line as it was just before the recently completed electrification work was put in hand.

[Reply to C. E. BEANES.]

Track-laying Machines.

On the Australian Trans-Continental Railway track-laying machines have been employed. These are an American invention which reduces labour, as the rails and sleepers are handled by machine instead of by hand; there is very little, if any, saving in time. Track-laying machines were used as long ago as 1891 on the Pacific extension of the Great Northern Railroad.

[Reply to G. BRITTAIN.]

London and North Western Railway History.

The Stanmore branch of the London and North Western Railway was opened December 18th, 1890.

[Reply to J. T. HARRINGTON.]

First half-yearly meeting of the London and North Western Railway was held on August 7th, 1846.

[Reply to PHILIP BESTER.]

London and South Western and Metropolitan Railways.

As there is no longer a through service of trains there is no use for metals connecting the London and South Western Railway and the Metropolitan Railway at Hammersmith (Grove Road).

[Reply to P. H. FLEMMING.]

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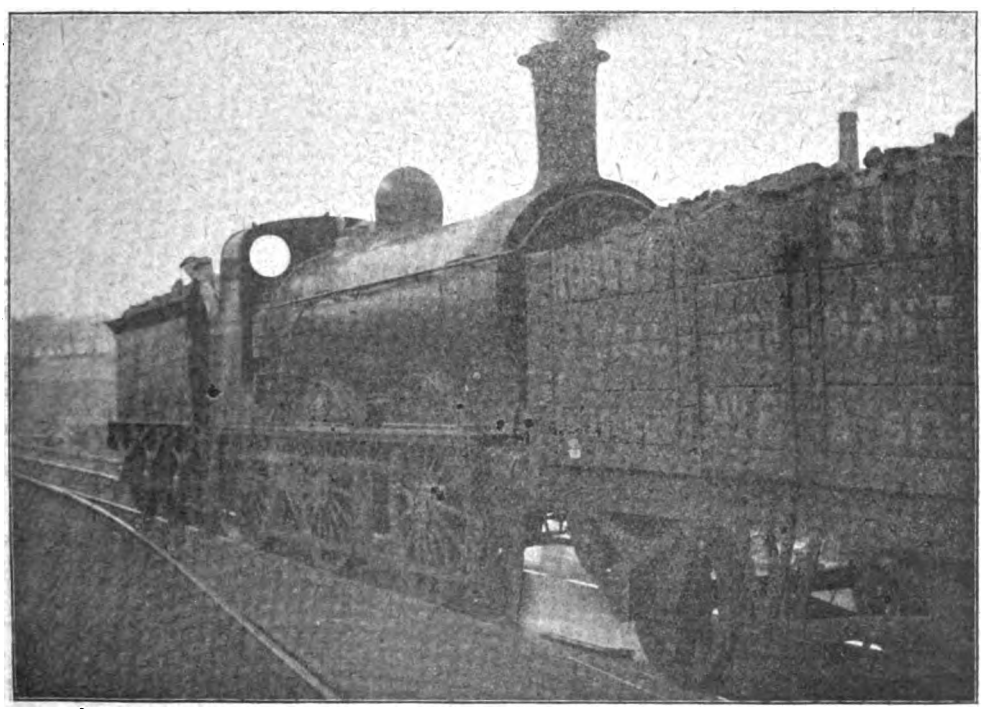
Railway Literature.

EXPERIENCES OF A RAILWAY GUARD. By James Ferguson. [Carlownie Cottage, Needless Road, Perth, 1s. post free, U.K. and Colonies.] As most who have attempted it have discovered, it is by no means easy to write a series of railway stories founded upon possible railway happenings. As a rule writers who turn out such stories have little or no knowledge of what can or might occur, and therefore, in order to obtain the sensational touch generally considered necessary, introduce features of an essentially non-practical character. In this volume of stories, which met with considerable acceptance in Scottish circles, the author, a main line guard on the Caledonian Railway, has to go back to the days before interlocking and the Westinghouse brake became standard for some of his more exciting incidents; but they are written by a practical man, and as such will satisfy the criticism of the railwayman or the general reader familiar with railway methods and possibilities. For this reason, a limited number of copies being still available, the attention of RAILWAY MAGAZINE readers may be directed thereto. We may also mention that a copy has been accepted by H.M. The Queen. Several of the stories are written in the form of reminiscences of old railway guards and drivers as told in the guards' and mess rooms. There are 19 stories, and the volume consists of 116 pages with frontispiece and cover portrait of the author in his van. The following is a list of the stories included (those marked with an asterisk are based upon actual occurrences): The Signalman's Daughter; The Night Mail Robbery; The Guard's Elopement; *The Engine with the Big Wheel; The Stolen Portmanteau; Shadowed!; *Asleep on Duty; *A Runaway Train; An Unauthorised Stop; The Missing Jewel Case; *The Fireman's Sweetheart; In the Nick of Time; Stopping the Mail; Guilty or Not Guilty; *Shunting for the Mail; On the Night Mail; Caught in the Tunnel; and *A Breakaway. Frontispiece, Caledonian Railway Engine, No. 903, *Cardean*.

A SCOTTISH PILOT.



Photo] [*W. F. Anderson.*

NORTH BRITISH RAILWAY.

Rebuilt Wheatley Locomotive, No. 1200, at Galashiels Yard, engaged in shunting.

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*Railways under War Conditions:

REDUCTION OF WORK.

WHETHER nationalisation of British railways will eventuate from the present State control is a question that is frequently discussed. The future is necessarily obscure, and, for our part, we are quite willing to adopt a "wait and see" policy. Advocates of State ownership may find many arguments in favour of their views from the fact that the railways have so successfully risen to the occasion of the great war. As Mr. W. M. Acworth recently informed an American audience, troops have been moved by the millions, guns by the tens of thousands, military stores in millions of tons. The traffic is altogether abnormal, the staffs are reduced, and women who have never been employed on railways before are trying to do the work of a greater number of men. But State control is not nationalisation. The management is still vested in the individual companies, subject to the co-ordinating influence of the Railway Executive Committee of General Managers. Primarily appointed to ensure that the military and naval requirements were adequately anticipated and met, the Railway Executive Committee has not only ensured harmonious working between all the railways, but has also brought the various managements together in a great variety of ways. Numerous economies not contemplated when the State took over the railways have already been effected, and many more have been discussed, while still others are gradually emerging from the region of theory to the "practical politics" stage. From the point of view of State control, the outstanding feature is that the State is reaping the advantage of these economies, and the fact that the railways have now been operated nationally for nearly three years has made easy the path of the reformer. In parentheses, however, we may say that State control has also very materially assisted the trade unions in securing concessions, and the enormous sum now being paid out by the railways as war bonus to the employees is indicative of what State ownership means in regard to the other side of the account. That aspect of the matter will loom largely when the time comes for making the decision whether the railways are to be wholly nationalised, partially controlled, or restored to company management. For the moment we need only remark that under no other system but State control would a war bonus of 15s. per week be paid on an all-round basis, alike to lads of eighteen years of age and the oldest employee—single and married men being placed on the same plane, no matter what may be their financial responsibilities or comparative wages.

The point we now desire to make is that economies have been effected by bringing the companies together. Many railwaymen and critics of railway administration have long held that this was possible. Indeed, we may recall that one railway shareholder put forward the suggestion that the companies should get together on the plane of a university—individual companies representing colleges, and a central authority the Senate, controlling and co-ordinating the whole. To this proposition the obvious pre-control reply was that the various conferences and Committees associated with the Railway Clearing House served that purpose. But, in the light of what has happened since August, 1914, it has to be admitted that they were not really effective. Under the regulations of the Railway Clearing House it was open to any company to dissent from a decision of the majority, with the result that many desirable reforms were thereby hung up. Competition, mutual suspicion, and, perhaps, even personal considerations, counted, and—need we say more? We have now no hesitation in saying that, come what may, if and when the railways revert to their old status the lesson has been learned. There will be a small, central co-ordinating body, and many of the reforms and economies that have resulted from State control and the operations of the Railway Executive Committee and other Committees associated with the Executive have come to stay.

What, then, has been the nature of the most important economies that have been effected? That is a difficult question to answer in the absence of statistical data. In the operating departments they have been very great, and there is no doubt that an enormous reduction of passenger train mileage has been the outcome of recognition of alternative routes. The common user of railway companies' open goods wagons is another reform that must have saved an enormous amount of empty wagon haulage. We submit that common user of vehicles—extended probably to all vehicles, other than of exceptional types—will be a permanent feature of railway operation. It may not be beneficial to individual companies having regard to the superior construction of their stock or for other reasons, but the obvious remedy is the adoption of standard types of vehicles by all companies. We believe that a move in this direction had been made before the war by the Scottish railways, who had prepared a scheme on the basis of the German railway car union. Some such an arrangement must have come, for the reason that no matter how comprehensive might be the arrangements for utilising wagons

* Published by arrangement with *The Railway News*.

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on their return journey, the fact that a wagon received loaded from one company had to be promptly returned to the owning line so limited the possibility of using it that empty vehicle haulage could not be prevented. Under the common user arrangement the vehicle is available for loading in any direction, and, if there is traffic, it is used. Empty vehicle haulage is now confined to the working of wagons away from stations or districts to which the inwards loading exceeds the outwards or vice versa. As regards privately-owned wagons, although a pooling scheme has yet to be devised by the powers of the Board of Trade under the Defence of the Realm Act to take over the wagons, steps have been taken to make use of them where possible for conveyance of traffic on the homeward journey. The future may have in store some system of pooling of locomotives, and possibly of coaching stock. In other directions we understand that much has been done by co-ordinating the collection and delivery of goods, and by mutual use of receiving offices, and more will probably be done, thereby closing some of the offices where those of several companies are situated together. As regards the working of goods and merchandise traffic, we may quote the recent announcement of the Railway Executive Committee that in consequence of heavy and increasing pressure upon the railways it has become necessary to co-ordinate the various railway companies' routes and facilities for the conveyance of merchandise by goods trains. On and from May 1st last, traffic for conveyance by goods train between certain points is only accepted and conveyed by selected railway routes. This arrangement, it was intimated, would facilitate through loading to destination and tend to a quicker rail transit. If this forecast proves to be correct, it must also follow that it must represent an enormous economy in railway operation. Quicker rail transit means that engine hours—and consequently the cost of coal and staff—are reduced, and we may look forward with interest to the results of this allocation of traffic being made known by the Railway Executive Committee, or by the Chairmen of individual railway companies on the occasion of the next annual meetings of proprietors.

But we may surmise that some of the greatest economies have been associated with office and clerical staff and general expenses. Advertising has practically ceased, not only as regards announcements in newspapers, but also in the hundred-and-one forms of pre-war advertising, from huge posters on advertising hoardings to the ordinary pictorial and other posters and folders. Much of this was associated with excessively cheap excursion trains, and as such will probably not be revived to anything like the same extent. Canvassing also has been stopped, while by a variety of arrangements office work has been reduced. Some time ago a circular was issued by the Railway Clerks' Association in which it was stated that as a result of the present unified control of the railways the work of large numbers of clerks, canvassers, collectors, district agents, etc., had been reduced or discontinued. These people ought to know, and we doubt not that they would advocate nationalisation of railways as being the readiest means of securing posts for the staff displaced by the reduction of work.

One of the first economies effected was the suspension of Railway Clearing House divisions. The arrangement under which the Government make up to each railway the amount of its net receipts to the 1913 level rendered unnecessary the accurate dissection and division of receipts from traffic conveyed over more than one railway system, as was formerly necessary in order that each company might have its proper share. This abolished at one stroke the work of some hundreds of Railway Clearing House clerks. It was followed by many other changes all tending to save office work. Thus an agreement was come to whereby claims for loss or damage of goods traffic are dealt with by the company on whom the claim is made, without any division of the amount paid between the companies concerned in the route by which the traffic was conveyed. Many similar developments could be cited, and while their origin was undoubtedly the situation created by State control they nevertheless partake of the nature of pooling or averaging the liability, and would probably remain in some form or another even though that control were to be withdrawn. Indeed, the system was by no means new. Parcels post receipts have always been divided between the railways in proportion to each company's parcels revenue, without regard to the actual carryings by individual companies.

Another important change was the decision to stamp instead of waybill all parcels traffic. For some years the local parcels traffic of certain of the larger railways was stamped thus saving the work of abstracting and preparing elaborate accounts. Where the traffic passed over the lines of two or more companies the waybill and abstracting system was universal, but under the present unification of railway operation it became possible to extend the stamping arrangement to all parcels traffic. This step, in turn, led to recognition of the fact that the ideal system is to secure that all charges should be prepaid, and in January last the Railway Executive Committee announced that passenger train traffic must be prepaid. This epoch-making step was announced in the following terms :—

> Notice is hereby given that, on and from April 2nd, 1917, the carriage charges for all descriptions of traffic for conveyance by passenger train or other similar service must be paid by the sender at the forwarding station.

This arrangement has been in operation for over two months, and we have every reason to believe that it is working well. The great advantage is that the responsibility for collecting charges rests with the station of origin of the traffic, thereby doing away with disputes as to

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whether the consignee or consignor is liable, and the many other disputes incidental to the previous system. For years such an arrangement was advocated—often the Post Office was cited as demonstrating that prepayment of charges might be insisted upon, but the companies could not be brought together. Now it has been done. The opinion of traders may be gathered from a reference to the matter in a recent issue of *The Birmingham Chamber of Commerce Journal*. After referring to the Railway Executive Committee notice, the journal remarks: "It was subsequently ascertained, however, that ledger accounts would be opened with traders who sent by passenger train habitually, which was found to meet the greater part of the objection raised." There is, of course, no objection to ledger accounts so long as traffic is booked paid. Moreover, it has been provided that firms having ledger accounts for parcels traffic shall assist the railways in preparing accounts by adopting what is known as the triplicate cart bill system. From a memorandum explanatory of this system which we have seen we understand that firms are supplied by the railway company, where needed, with the sheets, and the company require the firms to enter on the sheets, in columns, the following particulars of the traffic handed in for conveyance:—

(1) Description; (2) Consignee; (3) Destination; (4) Weight; (5) Whether C.R. or O.R.; (6) Sender.

The sheets are required to be made out in triplicate by the use of carbons and two copies handed to the Company at the time the traffic is collected. A signature is given by the vanman on the third copy, which the firms retain. The three copies all bear the same number. On arrival at the station the parcels clerk inserts the charges on the sheets, a carbon being used. One sheet then answers the purpose of a counter book—the items are not passed through the office counter book, but the totals are recorded, and the other sheet is returned to senders. The sheets are again used at the close of the month in making out the firms' accounts, and the totals of the sheets are shown instead of each individual item. The number of the sheet is also quoted.

This saves a very considerable amount of work to the company and the firms, as it enables the latter to check their accounts day by day, which is much easier than having to check a large account at the close of the month. Another advantage is that there is less likelihood of errors by including wrong parcels on accounts, and errors in charging can be taken up and dealt with immediately. There is also an advantage in reducing the Company's outstandings.

Having taken the plunge in regard to parcels traffic, we suggest that the railways should now proceed to deal with traffic by goods train. If economies have resulted from the prepayment of parcels traffic charges—and we are assured they have—how much greater would be the savings in the case of goods traffic? It might be desirable to proceed in stages, but there is no reason why that section of goods traffic which is known as "smalls" should not be prepaid. The companies have, of course, considered the matter: what is necessary is that they should act. The advantages incidental to entering traffic paid are many. The contract for conveyance and the debit are at the station where the traffic originates. There would be one principle of invoicing which would fix the responsibility for carriage charges on the sender of the goods. As each station would of necessity have to clear up any mistake made, greater care might be expected to be exercised in carrying out the invoicing work. The trouble and correspondence incidental to receipt of goods unentered would be reduced if not abolished. Inwards accounts would be a thing of the past, except for such charges as demurrage, siding rent, warehouse rent, cartage, etc., arising at the receiving station. Delivery of goods would be expedited, carmen would get away from the station sooner, they would have no money to collect on their rounds, and would merely have to obtain a receipt for goods delivered. Office work would be enormously reduced—the introduction of mechanical appliances for accounting work would be facilitated, and correspondence would be saved. If also the triplicate consignment note system were brought into general use firms' accounts would be easy of preparation as compared with the large, complicated accounts that have now to be prepared. Some disadvantages might be cited, but they are far outweighed by the advantages.

Considerations of space compel us to be brief in regard to other economies that have been effected. Statistical statements and returns have been overhauled—the Great Western and London and South Western Companies having appointed Committees of expert officers to take this work in hand—correspondence has been reduced, and new methods of performing office work have been devised. Not even used paper has escaped attention. *The Times* is responsible for the statement that one large company has turned out for re-use or sale many tons of paper, the present value of which runs into hundreds if not thousands of pounds. Notices, memoranda, etc., are quite as effective when printed on paper that has been already used on one side as they are when printed on blank sheets of paper. This method of meeting the present shortage of paper may well be recommended for general adoption, and should result in an immense quantity of paper being again used or, what is of equal importance, sent to the mills.

We submit that we have been able to show that the railways have discovered how and where to effect enormous economies, largely the result of the circumstances brought about by the present national emergency. Railways are now controlled by the State, but whether or not this control continues we have no doubt that most of the economies will remain permanently operative.

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PERTINENT PARAGRAPHS

Our Frontispiece.

OUR colour plate depicts Great Northern 2–6–0 express superheater goods engine No. 1636. This particular wheel arrangement, known colloquially as the "Mogul," had found very little favour in Great Britain—it had, indeed, scarcely been seen over here at all, save for the goods engines purchased by the Midland, Great Northern and Great Central Railways in 1900 from the Baldwin and Schenectady Works of the United States—when an epidemic of 2–6–0 building commenced in 1911. Led by the Great Western, the Great Northern Railway followed suit in 1912, and subsequently the Caledonian, Glasgow and South Western and London, Brighton and South Coast Railways.

Our plate shows one of the first Great Northern series—Nos. 1630–1639, commenced in 1912 and completed in 1913. A second series, bearing the Nos. 1640–1649, appeared in 1914, and a third series of ten, from 1650 upwards, is now all but completed. The second and third batches differ from the first in having much larger boilers, with a diameter of 5 ft. 6 in. in place of 4 ft. 8 in., and a total heating surface of 2,070 sq. ft. against 1,421 sq. ft. Other dimensions are generally similar, save that Nos. 1640–1659 weigh 2 tons more each than Nos. 1630–1639.

No. 1640 is fitted with the Robinson superheater, and is the standard type of 2–6–0 engine on the Great Northern Railway. These new engines are not now painted with the ordinary Great Northern green. They are painted grey and picked out with white lines.

These engines are employed mainly on long-distance express goods service, for which they are especially well suited, but they do duty also on stopping passenger trains, and have occasionally been seen on express passenger duty. We believe that one engine of this type has been tested to a maximum rate of 75 m.p.h., so that, despite the moderate diameter of the wheels, the engines are in no way deficient in the matter of speed.

The Great Northern express goods engine illustrated is fitted with Wakefield's Patent No. 7 Mechanical Lubricator and Patent Anti-Carboniser.

Suggested All-British Railway Museum.

IT is several years since the desirability of a National Railway Museum was first mooted in the RAILWAY MAGAZINE. The idea still has its adherents as the following letter from Mr. Harry T. Kerr bears witness. Mr. Kerr writes :—

"In the May issue of the RAILWAY MAGAZINE (on the continued excellence of which, under the present most difficult circumstances, may I be permitted to congratulate you ?) there is a note on the intention of the Japanese Government to form a railway museum. It is nothing short of a national disgrace that no All-British Railway Museum exists for preserving in chronological sequence the inception and progress of our national railways. It is high time that this was remedied and the Government should be urged to provide the necessary funds.

"Amongst the numerous sites acquired for war purposes there should be no difficulty in finding a suitable location, so that when the Great War ends in a victorious peace a fitting place may be found for housing in honour specimens of the various types of locomotives from the giant 4–6–0's to the little 'Teddy Bear' from Aldershot, which have crossed the sea to 'do their bit' in the titanic struggle for truth, right, and humanity.

"No branch of British trade has done higher service with hand and brain for Britain's needs than the British railways and such a foundation would be a noble monument to the fallen and a fitting expression of the nation's gratitude for such transcendent patriotism and heroic sacrifice."

Railway Expansion in the Malay Peninsula.

NOTWITHSTANDING the turmoil in Europe, the British authorities in the Malay Peninsula have been steadily pursuing a progressive policy of railway extension which has been retarded only by the difficulty of obtaining supplies of ironwork from the United Kingdom.

Under the Treaty of 1909 which transferred the Malay States of Kedah, Perlis, Kelantan and Trengganu from Siamese to British suzerainty, the Federated Malay States authorities agreed to lend a sum of £4,000,000 (afterwards increased to £4,750,000) to the Siamese Government to enable Siam to extend the State Railway southwards to form connections with the Federated Malay States Railway at the frontiers of Kelantan on the east and of Perlis on the west. The work has made steady progress, and is rapidly nearing completion. On their part, the Federated Malay States Railway authorities have been pushing on the extensions northward, through the western States of Kedah and Perlis ; and recently Mr. P. A. Anthony, the General Manager of the Federated Malay States Railways, accompanied by some members of his staff and Mr. H. Gittins, the Chief Engineer of

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the Siamese State Railway, made the journey by train from Bangkok to Prai on the mainland, opposite to the Island of Penang, by way of Bukit Mertajam, the junction in Province Wellesley. The party was thus the first to make the journey over the new railway connecting Singapore and Penang with the capital of Siam.

The line on either side of the frontier cannot be considered complete, and may not be opened to general traffic till next year. A number of bridges and other masonry work remain to be completed on the Siamese side, and the final work will be taken in hand as soon as possible under present war conditions, with the necessary iron-work impossible to obtain from England. On the British side, only the iron-work of a few bridges awaite completion. Portions of the line have been finished in Northern Kelantan, while an extension of the existing Federated Malay States Railway system has been made from the junction at Gemas, through the eastern State of Pahang northwards as far as Kuala Lipis, with a view of linking up with the Kelantan section as soon as opportunity offers.

The value of these railway extensions will be obvious to anyone who takes the trouble to look at the map of the Malay Peninsula. The railway will open up rich tracts of land for mining exploitation and tropical cultivation in a region which has already proved a valuable asset to the British Empire. Its commercial convenience will also be great, while transit for mails and passengers from Europe to Bangkok will be shortened by several days, and the sea journey up the Gulf of Siam—a nasty one in the north-east monsoon—will be avoided.

The Canadian Pacific Railway as an Imperial Link.

A USEFUL folder setting forth facts and figures and illustrated by railway, steamship, military, agricultural and other pictures has been issued by Mr. George McL. Brown, the European Manager, 62, Charing Cross, London, S.W. The cover is illustrated with a cartoon which appeared in *Punch* on October 15th, 1887, to commemorate the establishment of a Pacific Service of steamers linking Canada with Japan and China by the Canadian Pacific Railway, closely following upon the completion of the work of building the railway itself across Canada. From the folder itself the following information is gleaned.

In 1903 the Canadian Pacific Railway purchased fifteen steamers for use on the Atlantic, and thus linked up Liverpool with Hong Kong by an All British Service of steamers and trains. In the close connection early established between the Canadian Pacific Railway and the Canadian-Australasian Line the Company created an additional factor in their Trans-Pacific ramifications, a factor which assists materially in the closer linking up, not only of the Mother of Nations with her Overseas Dominions, but of the Dominions themselves. Canadian-Australasian steamers leave Vancouver at regular intervals for New Zealand and Australia, calling *en route* at Honolulu and Suva, Fiji Islands. From Sydney there are services to Manila and Hong Kong, where connection is made with Canadian Pacific steamers, which are the largest and fastest vessels on the Pacific Ocean.

The Canadian Pacific Railway not only crosses Canada from Atlantic to Pacific and serves every important town and farming district in the Dominion, but also connects up with all parts of the United States of America. The following figures will give some idea of the tremendous growth of the Canadian Pacific Railway since a through service was inaugurated in 1886.

	1886.	1916.
Railway mileage owned, leased, and controlled	4,651 miles	18,234 miles
Locomotives	372	2,255
Passenger, freight, and various cars	8,880	98,176
Freight carried	2,046,195 tons	29,276,872 tons
Passengers carried	1,899,319	13,833,978
Gross earnings	$10,081,803	$129,481,885
Net earnings	$3,703,486	$49,225,920

The Canadian Pacific Railway is one of the world's largest landowners, for in the Provinces of Alberta, Saskatchewan, and Manitoba, the Company owns some 6,000,000 acres of the finest virgin land, which it received as a grant for the construction of its transcontinental line, and which was most carefully selected before the incoming settlers had taken up the choicest parts. It is this land which the Company now offers on terms which have never been surpassed in the history of colonization. The Canadian Pacific Railway Company is not a land-selling organization in the ordinary sense of the word. Its chief business is to handle traffic, and in order to produce traffic it desires industrious, successful settlers located along its lines. For that reason it is able to give terms and assistance more favourable to the settler than is possible for any company which aims to make its profits simply out of the sale of land.

In addition to its land the Canadian Pacific Railway owns a telegraph system of over 110,000 miles; a chain of luxurious hotels at all the chief commercial and tourist centres throughout Canada; and up-to-date steamers on the great lakes and on the rivers and coasts of British Columbia.

Schoolmasters or mistresses can obtain a large wall map of Canada, and a book with over 100 illustrations, entitled "Across Canada by Canadian Pacific Railway," suitable for geography lessons, on written application to Mr. George McL. Brown at the address before mentioned and from him lantern slides for lectures can be borrowed free of charge on certain conditions. Applicants in writing Mr. George McL. Brown should mention the RAILWAY MAGAZINE. His portrait appears on page 41 of this issue.

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Packing Electric Locomotives for Export.

THREE big electric locomotives, built at Schenectady, U.S.A., for export to the iron mines of South America, were recently prepared for their voyage of more than 6,000 miles. Each locomotive was taken apart after completion, and made up into packages which would allow handling at the loading and unloading wharf by the ship and dock cranes. These cranes are seldom made for handling loads of more than 40 tons at the average shipping port. Since each of the electric locomotives weighed 120 tons, and was practically a duplicate of a half unit of the electric locomotives which haul the trains of the Chicago, Milwaukee and St. Paul Railway through the Rocky Mountains, it was impossible to load them on shipboard fully assembled. It was, therefore, decided to take the locomotives apart, classify the different parts, and box them into shipping cases of a size easily handled by the ship and dock cranes. Notwithstanding that one locomotive was made up into 62 separate packages, and occupied eight freight cars when ready for shipment, some of the parcels were large and heavy, the largest one being more than 45 ft. long and weighing approximately 23 tons.

The locomotives were first erected as if they were to be shipped out on their own wheels. Then they were put on test lines, and after the tests were over, each locomotive was taken apart. The various parts were all marked or ticketed in systematic order, so that the locomotive could be re-assembled when it was delivered at Cruz Grande, Chili, exactly as it stood after the test. In the taking apart process the trolleys were first unbolted, the hatch covers removed, and the interior electrical equipment and delicate electrical instruments removed, the heavier parts, such as the motor generator set, being lifted out through the roof.

While these parts were being packed preparatory to shipment, the roof, weighing 5 tons, was removed in one piece, this being made possible by the use of bolts and nuts for holding the roof and sides together instead of the usual rivet construction. The roof and platform were then packed and boxed together, and they made the largest and heaviest single package in the entire shipment. The platform proper was the heaviest part of the shipment, weighing about 16½ tons. The motors were then unbolted from the trucks, the brake rigging and accessory apparatus dissembled, the trucks separated, and the axles removed. When completely prepared for rail shipment, each 120-ton locomotive occupied eight cars, including three box cars for the smaller packages, and five flat cars for the heavier packages and unboxed parts. On reaching the Harlem River, these cars were unloaded on to one of the harbour lighters, and transferred to a Brooklyn pier for shipment on South American freighters.

In Chili, the locomotives will operate on one of the most unusual ore carrying railways in the world. Although the mines are only four miles inland, the railroad winds in and out to a total distance of 15 miles, this roundabout route being necessary in order to limit the gradients to 3 per cent. The total ascent the trains must make in order to reach the mines is 2,200 ft. above sea level, and the intention is to haul from 12 to 20 fifty-ton ore cars with one electric locomotive. The ore will be shipped from Cruz Grande to the United States of America.

Control of Coal.

IN the difficult duties he has undertaken as Coal Controller, Mr. Guy Calthrop, General Manager, London and North Western Railway, is gaining considerable credit and there is little doubt his appointment is proving a boon and a blessing, not only to the coal consumer, but also to the much harassed coal merchant, to say nothing of the coal factor and the coal trade generally.

Addressing the annual meeting of the Institution of Gas Engineers, Mr. Calthrop remarked that the object of instituting the control of coal mines had been to get all the industries as far as possible to work together in the interests of the nation during the present crisis. They wished to disturb as little as possible the tendency of trade. He had two great problems to deal with: First of all, the reasonable supply of coal to London and the counties of Great Britain most remote from the coalfields during the next winter; and, secondly, they must help the railway companies in their present difficulty of transport.

The object of their new scheme was to secure that coal should be consumed as near as possible to the points of its output. The scheme, as far as they had gone, at present dealt with the output of 40,000,000 tons per annum. If they could secure the carrying out of the scheme it would materially assist the railway companies during the winter. If the war were to be over to-morrow the transport difficulty would continue. The transport of coal by ships from such places as Durham and Northumberland to the south of England could not bulk in the future anything like it had done before the war.

Pooling of Locomotives.

IN the course of his presidential address to the Institution of Locomotive Engineers, Mr. A. D. Jones, who as most RAILWAY MAGAZINE readers are aware, is out-door Locomotive Superintendent of the South Eastern and Chatham Railway, dealt with the important and often debated point of the desirability or otherwise of the pooling of locomotives. Mr. Jones remarked that in the days when a driver was always kept to one engine he showed far more interest in his work and care of the engine. Owing, however, to the reduction in working hours of the enginemen a large proportion of the locomotive stock is double shifted, and there is not so much personal interest shown by the drivers. General pooling of locomotives is an objectionable system both from the point of the men as well as from the maintenance of economy in the use of fuel and oil. It can generally be arranged for an engine to have the

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same two sets of enginemen booked to it. A locomotive is very similar to a horse, that is to say, it nearly always differs in some slight respects from others in its class, and a driver learns the peculiarities of a particular engine or horse and knows how to humour it and so get the best results. On some railways great care is taken to keep the locomotives clean, and there is a great deal to be said in favour of the practice. In the first place it enables the driver or mechanic to detect flaws. Secondly, the drivers and repair staff do their work without getting so dirty themselves; and thirdly, it tends to make enginemen take a pride in their work. At the same time it often occurs that too much attention is paid to the exterior, namely, the boiler and tank sides, whilst the motion and springs are somewhat neglected.

Proposed Goods Clearing House Scheme.

FROM Mr. A. W. Gattie, 11, Montague Gardens, Birch Grove, Acton, W. 3, the RAILWAY MAGAZINE has received the letter which follows this paragraph. Being a monthly publication the RAILWAY MAGAZINE is not suitable for a newspaper controversy, but as Mr. Gattie offers the substantial reward of £100 if certain objections to his scheme are forthcoming, we publish his communication and leave our readers to take up with him if they so desire. In the case of Mr. W. J. Scott, B.A., we shall be pleased to print his reply to Mr. Gattie, who writes:—

"With reference to the very interesting meeting held last night at the Railway Club; it appears to me that if there is any vital objection to the Goods Clearing House System, which can be specifically advanced, and supported by figures, it should be advanced now. I personally would be willing to pay £100 for such an objection if it can be produced. I suggest that the adjudicators should be the consulting engineers of the New Transport Co., viz., Mr. James Swinburne, F.R.S., and Dr. Hele Shaw, F.R.S., or other adjudicators to be determined upon. The Rev. Mr. Scott yesterday raised the objection that the introduction of Clearing House methods would involve the 'scrapping' of London. He appeared to think that London streets would be unable to accommodate 5 per cent. of the heavy traffic they now accommodate. I would remind you that Mr. Edgar Harper, who was nominated by Mr. J. Burns to investigate this matter, reported that the Clearing House could be amply served by a fleet of 5,000 motor lorries under the conditions specified by me. It is for the Rev. Mr. Scott to show how a small fraction of the present number of vehicles could possibly congest the streets which now accommodate the whole. If the Rev. Mr. Scott disputes Mr. Harper's figures, will he produce his own?"

Railways and the State.

IN an able contribution to *The Financial Review of Reviews*, Mr. E. T. Good makes some pertinent remarks concerning the relations of railways with the State. Mr. Good sums up the result of his careful consideration of the subject by pointing out that "For the period of the war the railways are under a special kind of Government control, the managers and staffs being temporarily employed as State servants, and the dividends are guaranteed, within limits; but there is a danger that in the coming peace the railways will either be left in such a weak position that they will be unable to raise enough new capital to maintain efficiency, or they will pass, by the process of nationalisation, into the hands of unprogressive, wasteful, and tyrannical bureaucrats. What is really needed is more freedom for the companies to work out their own salvation, under the stimulus of competition, the State merely acting as a guard against the abuse of such freedom. Nationalisation would not alleviate, but aggravate, most of the evils complained of, and it would create new ones. On the other hand, the continuance of a system under which everybody is permitted to charge the railways what he likes for his products or services, whilst the railways can only charge what is arbitrarily fixed by Parliament, is impossible. But before a policy that is fair to both sides can be devised, all the facts of the problem—certainly such facts as are set out above—must be fairly and squarely faced by Parliament and the nation. Above all, the idea that we can have low ton-mile rates in this crowded little island must be dropped. British traders cannot have it both ways—they cannot have low rates as well as short hauls. As for the idea that our railwaymen, managers, and engineers would in some mysterious way suddenly become more efficient under the State than in the employ of the companies—well, it is worse than childish. Improvements in the railway service are possible, and will be effected naturally and economically without State ownership, provided the companies are accorded a reasonable measure of those rights that are enjoyed by other enterprises. It is in the interests of the ordinary trader and traveller as well as the railway shareholder that the companies should be enabled to make reasonable profits, pay fair dividends, and attract a sufficiency of capital for healthy development."

Mr. Good might with advantage have directed attention to the fact that so far from the State improving the efficiency of railway officers, the course of the current war has proved beyond all question the capacity of railway officers to vastly increase the effectiveness of the State.

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WHAT THE RAILWAYS ARE DOING

QUITE a number of London and South Western Railwaymen have entered the military service as members of the Royal Flying Corps. Mr. Smyth, the railway's Paris Agent, was one of the first to distinguish himself as a pilot over the Western front. One of the latest flying men from the London and South Western Railway service is 2nd Lieut. R. Milton, R.F.C., who was in the Accountants' Goods Audit Office. His portrait appears on this page.

* * *

ON June 6th, in the Board Room, London Bridge, Lieutenant Colonel Charles L. Morgan, R.E., was presented with a standing hall clock by the Chief Officers of the London, Brighton and South Coast Railway on his retirement in February last from the office of Chief Engineer. Sir William Forbes, the General Manager, in asking Colonel Morgan to accept the gift, made a charming allusion to the cordial relations and feelings of respect and affection which had always existed between Colonel Morgan and his own colleagues, of which he hoped the clock would be a constant reminder to him, and he congratulated himself and the staff on the fact that Colonel Morgan would remain with them as a Director. Colonel Morgan thanked the donors and said that notwithstanding his translation from the post of Engineer to the office of Director, he should still regard himself as one of those then present. The occasion was somewhat delayed by reason of the absence of Colonel Morgan abroad upon important national work. Amongst those present were Mr. G. Allen, Estate Agent; Mr. Philip Dawson, Consulting Electrical Engineer; Mr. C. A. de Pury, Accountant; Mr. James Ford, Auditor; Commander Wm. Morris, Marine Superintendent; Mr. E. A. Scanes, Solicitor; Mr. H. A. Sire, Goods Manager; Mr. W. J. Williams, Continental Traffic Agent; and Mr. W. H. Fox, Stores Superintendent, and apologies for unavoidable absence were made by Mr. Wm. Cash, Auditor; Mr. C. A. Morgan, Paris Agent; Mr. Finlay Scott, Superintendent of the Line, and Mr. Wm. Turner, Medical Officer.

A LONDON AND SOUTH WESTERN RAILWAY FLIER.
2nd Lieut. R. Milton, R.F.C.

* * *

DEATH has removed, at the age of 61, Mr. Harry Trasler, a much respected member of the Mineral Manager's staff, Midland Railway, Derby. The deceased commenced his career in a land agent's office at Market Harboro'. He entered the service of the Midland Railway in October, 1874, in the Mineral Rates Office, Derby, with which office he throughout retained a connection, being made Chief Rates Clerk in March, 1907. This position he held up to the time of his decease.

* * *

ANOTHER link with early railway days has been broken by the death at the age of 91 of Mr. Richard Haig Brown, who for many years was Superintendent of the Manchester South Junction and Altrincham Joint Railway. He was, as a young man, on the staff at Euston with George Stephenson.

* * *

MR. SAMUEL BOWER, on his appointment to the chief position in the department has received from the staff of the Midland Railway accountants' department a congratulatory address. A small committee carried out the arrangements, Mr. Winfield acting as chairman and Mr. A. R. Henshaw as hon. secretary. The address, which was contained in a blue and gold morocco-bound album, was beautifully and artistically illuminated.

* * *

AFTER 30 years' occupation of the post of Chairman of the Londonderry and Lough Swilly Railway, Sir John McFarland, Bart., D.L., has resigned. Mr. J. B. Mullin, D.L., has been appointed chairman of the company, and Mr. J. J. Colhoun, secretary. Sir John McFarland is not retaining a seat on the Board of Directors.

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LONDON AND SOUTH WESTERN RAILWAY RIFLE CLUB.
Winners of London Railways Rifle League, 1916–17.

MR. CHARLES STUART, whose death has occurred at Aberdeen, started his business career in the service of the Great North of Scotland Railway, afterwards going to India, where he became Deputy Auditor and Accountant of the Eastern Bengal Railway, a position which he relinquished to become Manager of the Great Southern Railway of Brazil, where he remained for over 12 years. He afterwards became Manager of the Costa Rica Railway in Central America and subsequently manager of the Salvador Railway. After his retirement 10 years ago he went to Peru to advise as to the laying down of a new railway there, and twice he visited that country to give advice in regard to the purchase of land and the arrangements for new railway construction.

* * *

SINCE the beginning of the year the Board of Management of the London and South Western Railway Orphanage at Woking have taken into their care 15 or more children. It is hoped what they are doing on behalf of the widows and orphans of the railway's deceased employees will induce those of the staff who are not contributors to the fund to consent to the deduction of a small weekly sum from the paybills. Regular passengers on the line are likewise invited to subscribe and help to keep the good work going during the present extremely trying and difficult times.

* * *

IN the power of increasing Britain's home-grown food supplies the country staffs of our railways have the advantage in the way of available plots for cultivation, and very satisfactory use they make of them, but many of the London men are this year putting in excellent work. Perhaps the most remarkable effort is that being made at Nine Elms, where some of the London and South Western Railway workers, with an enthusiasm which does them infinite credit, have broken up a bit of the yard in the vicinity of the Old Loco. Works, and after clearing the "soil" of sundry decayed sleepers, pieces of scrap-iron and broken brick, are cultivating potatoes and other produce.

* * *

FORMED in 1901, the London and South Western Railway Rifle Club has from its inception reflected no small credit upon its promotors. Its most recent achievement has been to come out first in the London Railways Rifle League, thus winning the Challenge Shield for the fifth time out of the six years the League has been in existence. On the other occasion the London and South Western Railway team was second to the London, Brighton and South Coast, being beaten by one point.

In the recent competition nine teams took part, and out of fifteen matches the South Western won fourteen and lost one, as will be seen in the accompanying table:—

Name of Club.	Mtchs.	Won.	Dwn.	Lost.	Pts.
London & S. Western	15	14	—	1	28
London, Brighton & S.C.	15	13	—	2	26
Great Eastern	15	12	—	3	24
London & North W. ..	15	8	—	7	16
South Eastern & C. ..	15	6	—	9	12
Midland	15	5	1	9	11

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Name of Club.	Mtchs.	Won.	Dwn.	Lost.	Pts.
Great Western ..	14	3	1	10	7
*Great Central ..	5	2	—	3	4
*District	11	—	—	11	—

* These clubs withdrew, the Great Central in consequence of their range being taken over by the military authorities, and the District owing to members joining the Colours.

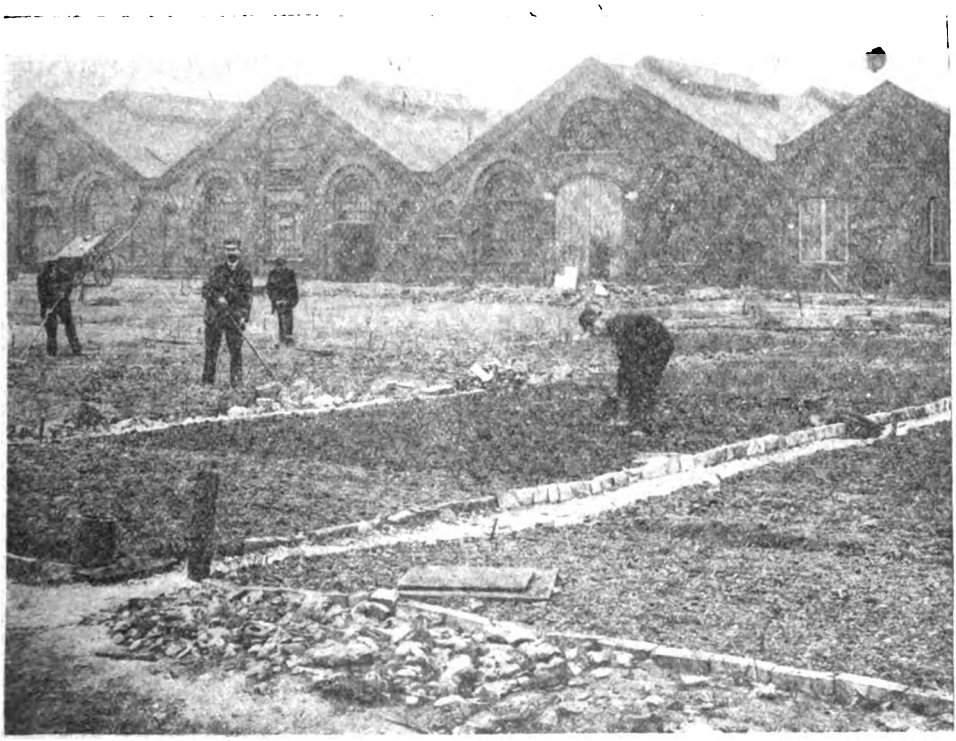
The South Western team have now held the Shield three years in succession, and we have pleasure in giving a photograph of the present winners. The names are (reading from left to right):—Back row: Messrs. J. Sharpe, A. Longhurst, C. T. Barnes, S. Derry, and R. Wilson. Front row: Messrs. J. Hazeldine, J. Cole (Capt.), F. J. C. Mercer, and H. Tagg. Two other members of the team, Messrs. W. Baker and G. Coffin, also took part in the competition.

* * *

At the Railway Club, 92, Victoria Street, S.W., on Tuesday evening, June 12th, there was a goodly muster. Mr. W. Parker presided and after the disposal of formal business, which included the election of two new members, the meeting settled down to hear Mr. Roy Horniman deal with his theme "The Great Railway Tragedy." Mr. Horniman adds to his merits as a novelist and a play-wright no mean ability as an orator, and he had an audience that thoroughly appreciated his skill in presenting his case, although the subsequent debate proved that on some points the members were far from seeing eye to eye with him. Mr. A. W. Gattie, whose scheme for a London Goods Railway Clearing House Mr. Horniman so strongly advocated, had a sympathetic hearing. Among the subsequent speakers, Mr. Webber (Great Eastern Railway) supported Mr. Gattie's scheme, but Messrs. W. J. Scott, past-president of the Club, Mr. B. M. Bazley, and Mr. Hadley (Great Western Railway) presented a number of views distinctly contrary to those advanced by Mr. Roy Horniman. Among those present were Lord Hedley, and the well-known railway writers, Mr. Cecil J. Allen and Mr. G. W. J. Potter. Mr. Miller, hon. sec., is arranging for a continuance of the debate on Tuesday, July 10th, at 7.15 p.m. A communication from Mr. Gattie as the outcome of the June meeting appears on page 62.

* * *

It is stated in the Channel Tunnel Company's report for 1916 that the construction of the tunnel will, it is anticipated, receive the serious consideration of the Government after the termination of hostilities. The plans for the construction of the tunnel have now to be revised in the light of recent experience and in accord with the alterations of the South Eastern Railway system necessitated by the cliff fall between Folkestone and Dover. With this object in view, and with the consent of the South Eastern and Chatham Railway, the directors



CULTIVATING NINE ELMS GOODS YARD.
London and South Western Railway.

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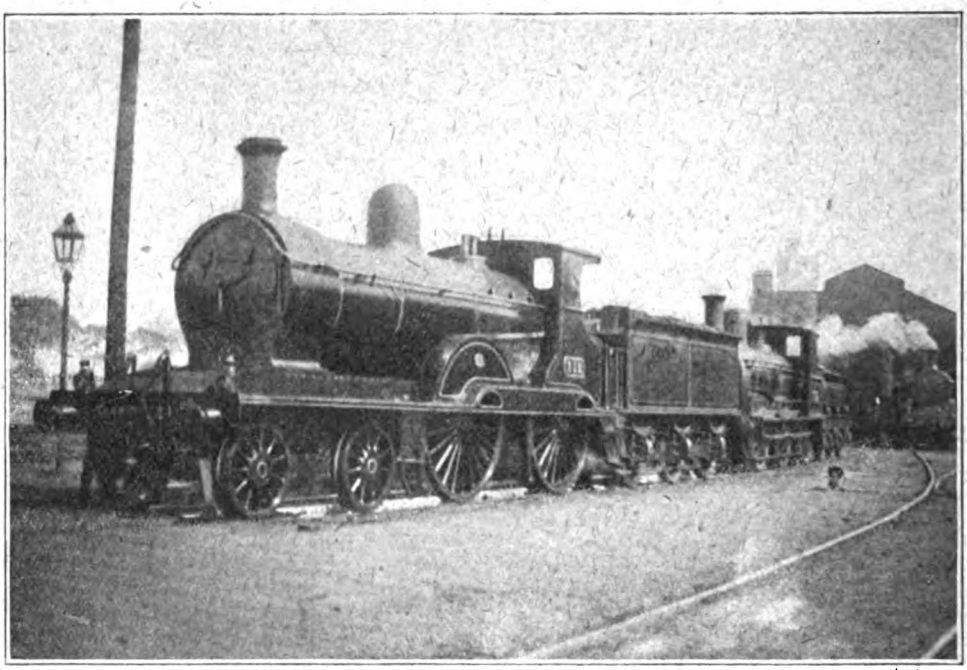

Photo] [*J. Macartney Robbins.*

GREAT SOUTHERN AND WESTERN RAILWAY.
4-4-0 locomotive No. 312 at Inchicore Sheds.

have appointed Mr. Percy Crosland Tempest, the chief engineer to the railway, to act as engineer to the Tunnel Company, in succession to Mr. Francis Brady, who has retired. Mr. Tempest will act in conjunction with Sir Francis Fox (of the firm of Sir Douglas Fox and Partners), who already holds the position of consulting engineer.

* * *

A SWEDISH doctor who recently returned through Germany from Vienna tells a remarkable story of the deterioration of the railways in the war-worn Central Empires. His observations were that the permanent way was in a very bad state, the rolling-stock was worn out by the strain of the war, and there was no means of repairing it, and engines had become so scarce that the loss of one engine meant more to Germany than the loss of three guns. Further reductions have been made in the passenger train service, and between Hamburg and Sassnitz, for instance, there are no trains running at all. The German Government are doing their best to remedy matters by borrowing engines and trucks from Holland and Denmark, and the Austrian Government have attempted to supplement their supply by smuggling engines from Switzerland.

* * *

IN further reply to a recent "Why and Wherefore" query, Mr. L. B. Hewitt, Bath, remarks :—"The correspondent who enquired regarding the name *Devonshire* on a Great Western Railway engine, may like to know that the name *Devonia* was borne by No. 3038, one of the famous 7 ft. 8 in. (4-2-2) 'singles,' now scrapped."

* * *

LIKE many other RAILWAY MAGAZINE readers at Wimbledon, Mr. C. E. Mitchell is greatly interested in the locomotives that are working, or have worked, on the London and South Western Railway, and he asks if fellow readers who possess the information can give him facts he desires to obtain. He writes :—"There are one or two Beattie 0-6-0 tender goods locomotives of the London and South Western Railway (rebuilt by Mr. Adams) which I am unable to trace the history of. The complete lists are supposed to be as follows : Nos. 273 to 278, built January, 1872 ; Nos. 285 to 290 (No. 290 being re-numbered 351 in December, 1899), built June, 1893 ; Nos. 302 to 313, built July, 1874 ; Nos. 336 to 347 (=347), built during the latter part of 1876 ; and lastly, Nos. 368 to 373, built April, 1878. All built by Beyer Peacock & Co., and rebuilt at various dates by Mr. Adams. But, in addition to these, I cannot account for No. 152, which is identical in appearance with the 336 class. No. 0152 was stationed in the London area for nearly two years on shunting duties. She was fitted with the Drummond chimney (I possess a photo of her with an Adams chimney), but she disappeared about three months ago in a rather bad condition. Then No. 0229, which belonged, or identical in appearance with the

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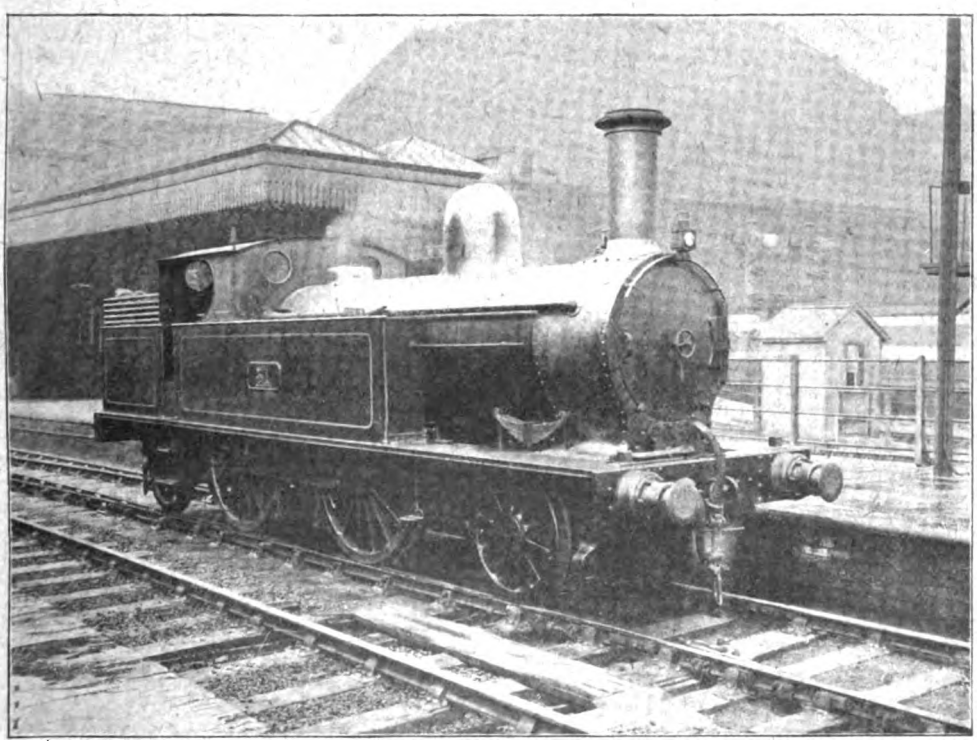
273 and 285 class with outside frames. She also was fitted with the Drummond chimney. She appeared at Wimbledon Yard about three times during December, 1914, but never since. Then No. 0160, which was up in this district in 1913, is said to be at Guildford, and has appeared as No. 160A. Is this correct? I understand that No. 370 (0–6–0 Beattie tender goods locomotive) has appeared as 370A, and would like to know where she is working and with what chimney the engine is now fitted. I believe there are not many of these goods locomotives in service now, but I should like to know about those that are. Then, in the June RAILWAY MAGAZINE the numbers of the tank engines working on auto services are tabulated. It would be of great interest if any correspondents living further down the line would write of any other 4–4–2T's or 4–4–0's working on auto trains."

* * *

IN reply to a question by Cadet E. Stanley-Jones, R.N., in the June RAILWAY MAGAZINE, Private Leslie J. Thompson, who in civil life is employed on the London and North Western Railway, kindly communicates:—"I can say London and North Western Railway Webb 4-cylinder compounds 1956, *Illustrious*, and 1972, *Hindustan*, are still unconverted, although upwards of 20 of these engines are now running as 2-cylinder simples ("Renown" Class). When I was home on leave a few weeks ago *Illustrious* was stationed at Northampton (Shed 5), often working on the Nottingham branch, and *Hindustan* was at Shed 30 (Shrewsbury)." Another RAILWAY MAGAZINE reader, Mr. Jack F. Dearden, likewise states that he saw these two engines as compounds about five months ago on the joint West to North main line of Great Western and London and North Western Railways at Church Stretton.

* * *

ONE more reply to Cadet E. Stanley-Jones, R.N., comes from a RAILWAY MAGAZINE reader of many years' standing, Mr. O. R. Hughes, Liverpool, who states:—"The 4–4–0 engines 1956 *Illustrious* and 1972 *Hindustan* have not been converted to simples of the 'Renown' class up to the latest date available. The engines so treated are:—1905 *Black Diamond* (Shed 19), 1913 *Canopus* (Shed 8), 1914 *Invincible*, 1918 *Renown* (Shed 14), 1921 *John o' Gaunt* (Shed 19), 1922 *Intrepid* (Shed 8), 1925 *Warrior*, 1930 *Ramillies*, 1935 *Collingwood* (Shed 19), 1943 *Queen Alexandra* (Shed 34), 1945 *Magnificent*, 1946 *Diadem* (Shed 15), 1948 *Camperdown*, 1951 *Bacchante* (Shed 8), 1959 *Revenge* (Shed 5), 1961 *Albemarle*, 1971 *Euryalus* (Shed 8). Twenty-seven 'Precursors' have also been fitted with superheaters and extended smokeboxes."



Photo] [*W. H. Whitworth.*

LONDON AND NORTH WESTERN RAILWAY.

2–4–2 tank engine (5 ft. 6 in.), No. 31, at South Junction platform, London Road station, Manchester.

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FOR the benefit of other RAILWAY MAGAZINE readers Mr. T. B. Welch, of Brighton, has kindly forwarded the following information:—London, Brighton and South Coast locomotive No. 325, *Abergavenny* (4-6-2 tank), has been fitted with Ross's "Pop" safety valves. "Moguls," Nos. 337, 338, 345, 346 have been fitted with top feed apparatus, and the remaining six are to be also fitted as they come into the shops. Five more "Baltic" (4-6-4) tank engines are to be built at Brighton works.

* * *

A LEICESTER reader, Mr. J. Pritchett, would be glad if some RAILWAY MAGAZINE subscriber would furnish him through this medium with any particulars concerning the London and North Western Railway locomotive *Thunderer*. He is anxious to know what work this engine is now doing.

* * *

IN answer to Mr. J. May concerning No. 689 0-6-0 T on the London, Brighton and South Coast Railway, Mr. A. R. B. Johns says:—"No. 689 was a standard E class tank named *Brest* and built by Mr. Stroudley in April, 1883. It had 17 in. by 24 in. cylinders, 4 ft. 6 in. coupled wheels, total heating surface, 852 sq. ft., afterwards increased to 1,039 sq. ft. As now rebuilt, she has a boiler of 1,053·6 sq. ft., total heating surface, grate area, 15·66 sq. ft., and working pressure, 170 lbs. The Stroudley round-topped tanks have been changed for square ones, an Earl Marsh cab fitted, and the copper-topped chimney discarded for a short, stumpy, cast-iron one. She is classed "E IX" and is now stationed at New Cross. The old number of *Brest* was 89, but when the big 4-4-2's T came out, this was changed to 689. This engine was probably an experiment and has been repeated in the 100-105 series of the same type, with the exception of slightly larger cylinders and heating surface. *Langston* was No. 264, not No. 247. This locomotive was called *Arlington*, and is, as far as I have heard, stationed at Dorking, though I have seen the engine but have not had ocular proof of its being shedded there. *Anerley* was No. 9, scrapped in 1904. *Tunbridge Wells* is No. 279, now stationed at Epsom. No. 356, *Coulsdon*, is now at West Croydon. *Winchelsea* was No. 401, stationed at Horsham." Mr. Johns, who resides at 3, Ashlake Road, Streatham, adds that he will be very glad to correspond with any RAILWAY MAGAZINE reader concerning the London, Brighton and South Coast Railway, as he lives very close to it and takes a very great interest in the working. Mr. J. Smith, 1, Bedford Place, Brighton, makes a similar offer. Eight other RAILWAY MAGAZINE readers have sent in replies to Mr. May's questions and thanks are due to all, but lack of space prevents the printing of their letters. If these readers would become members of the Railway Club, 92, Victoria Street, London, S.W., they would be able to meet there and discuss these matters *ad libitum*.

FOR the information of others who like himself, follow with keen interest the fortunes of London and South Western Railway locomotives, Mr. R. S. Clark, of Wimbledon, writes that two more of these engines have been rebuilt with Eastleigh superheaters. The locomotives are 4-6-0 class B, No. 459 and 4-4-0 class D, No. 470.

* * *

FROM the South of Scotland Mr. Malcolm M. Niven writes:—"I have just been studying that excellent book by Mr. E. L. Ahrons 'The Development of British Locomotive Design,' and in his allusion to valve motions and valve-chests placed outside I can cite some cases. There used to be a locomotive on the Caledonian—a little tank engine—it ran the observation saloon used by the officials; it was No. 1A, I think; it had all on the outside eccentrics, link-motion and valve-chests, also cylinders; it presented a curious appearance, it had a somewhat long chimney, it was in service in 1898, but of recent years the 4-2-2 engine No. 123 does this duty, or till recently did it. The Dalmelling Iron Company have a large tank engine, also with all outside cylinders, eccentrics, and link motion; it is seemingly an old engine. There was also an engine belonging to a railway contractor, which was engaged on the Barrhead District Railway during its construction, with this outside arrangement of valve-gear. This is about 15 years ago. All locomotive devotees ought to have Mr. Ahrons' book, as nothing pertaining to the development of the locomotive is left out, and it is a book for the locomotive world of standard practice."

* * *

"THE old 0-4-0 tender engines of the Glasgow and South Western Railway which Mr. James Stirling designed, are now fast diminishing," says the correspondent referred to in the foregoing paragraph. "I saw one, however—R.39—shunting in the vicinity of Dalry (Ayrshire) recently; these engines used to work collieries where curves were sharp and lightness was necessary; they had a tender with 4 wheels instead of 6 as is usual. Many of them were rebuilt by the late Mr. Smellie, and Ramsbottom valves were put on them in place of the Salter balances. During the ballasting of the Canal Railway about the year 1887 I remember one of them, No. 86, on the ballast; she had the Salter balances and the wooden brake blocks, also the screw reversing gear with horizontal hand wheel and perpendicular column associated with the Stirlings."

* * *

CONTINUING, Mr. Niven states: "There is again on the metals, after being painted and put through overhaul, the old 2-4-0 engine, No. 71A, which I heard was to be broken up, but she is at Ayr. I saw her there, she has her oval cut-out splashers yet. The new 0-6-2 tanks are working much heavy mineral traffic; many are to be seen about Ayr, Waterside and Dalmellington. I saw No. 91, which is now replacing the 0-6-0 Smellie No. 91, which is on

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the duplicate class, and is No. 91A. Smellie No. 100 still is No. 100; she has peculiar interest to me as I fired her for some time."

* * *

FROM Lausanne a RAILWAY MAGAZINE correspondent writes that the Swiss Federal Railways are now supplying their own locomotives to work their goods trains in France. At present the engines go from Geneva to Ambrieux, and the type employed so far are the large 2-10-0 locomotives of the 2900 class, built for the Gotthard. He understands that the Swiss Federal Railways are shortly going to run the trains in Savoy in order to relieve the French.

* * *

IN reference to a paragraph in June RAILWAY MAGAZINE concerning Great Western Railway engines numbered in the 1300 class, a Bristol reader (J. N. F.) states:—"No. 1311 is a small 0-6-0 saddle tank engine built in 1864 by Gilkes, Wilson and Co., Middlesbrough. It has 4 ft. wheels, with no flanges on the middle pair. The working pressure is 140 lbs., and the cylinders have, I believe, a 24 in. stroke. The engine has no bunker but coal is kept on the footplate at the left-hand side of the firebox. It is named *Cheesewring*."

* * *

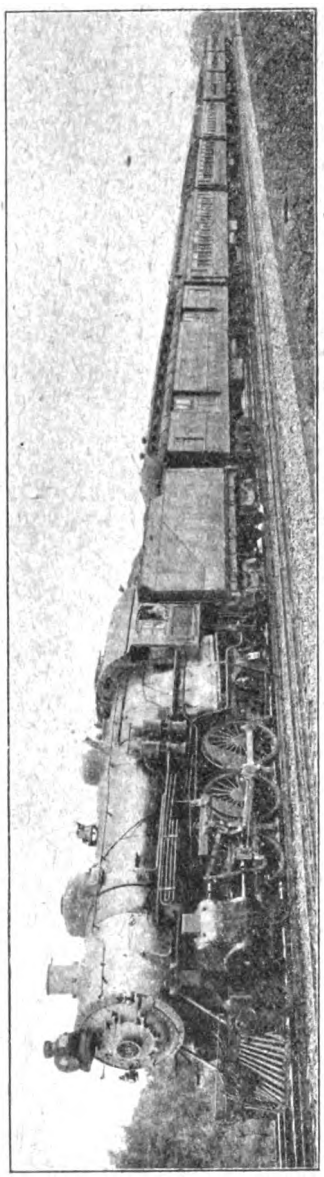
A RAMSBOTTOM reader, Mr. E. Cyril Bourne, writes:—"I have noted two more of the Lancashire and Yorkshire 2-4-2T engines having received superheaters, 45, 1035 (1008 class). There are now only six passenger tank engines at Bury; three of them are the large bunkered type sent last December to work the Bacup trains from Victoria *viâ* Heywood, the other three are 1008 class, and one of them generally works the ballast train. Also some of the Beyer Peacock 4-4-0 engines have come to Bury for secondary goods work, there are three or four, I have noted three, one of them, 982, is a rebuilt engine with Belpaire firebox."

* * *

THE train illustrated on this page is the Baltimore and Ohio Railroad Company's "New York-Chicago Limited," officially known as No. 5, which runs daily, leaving 23rd Street, New York, at 8.5 a.m. (Liberty Street 8.15), and arriving 63rd Street, Chicago, at 9 a.m. (Grand Central 30 min. later) the following morning. An extra fare of $2.00 is charged on tickets between the terminal points, which is refunded if stopover is made *en route*. The equipment is all-steel, and comprises the following: Coaches and Pullman compartment drawing-room, sleeping and library, lounging observation cars, New York and Washington to Chicago, and Pittsburg to Chicago; drawing-room parlour car and dining car New York to Pittsburg; dining car Garrett to Chicago. The train is vestibuled and all cars are lighted with electricity.

* * *

IN the House of Commons recently, reviewing the work of the Post Office, the Postmaster-General (Mr. Illingworth) referred among other things to the Post Office (London) Railway. He said that this useful scheme had been continued slowly during the year. Some people had criticised the continuance of the work during the war, but he thought it would have been unwise to have discontinued the work, as the contractors were committed to a very large expenditure. The course which the Government had adopted he thought in the long run would turn out to be the cheaper and better way. Only two small sections remained to be finished,



BALTIMORE AND OHIO RAILROAD. "New York-Chicago Limited."

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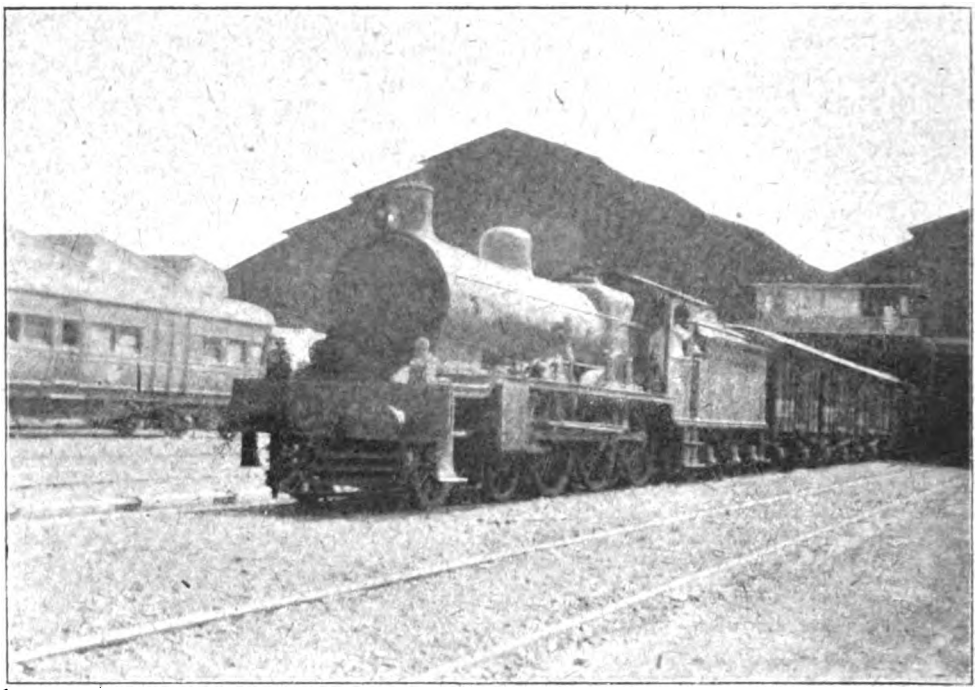

Photo] [*P. B. Porter.*

GREAT INDIAN PENINSULA RAILWAY.

Empty Fruit Special leaving Victoria Terminus, Bombay.
4-6-0 Express Locomotive, No. 424.

one near Liverpool Street and the other between Mount Pleasant and the West Central Post Office. The laying of the permanent way and the electrical equipment had been entirely suspended until the end of the war.

* * *

WE regret to record the death of Mr. Robert Scott Skillington, London and North Western Railway district goods manager, Northampton. He was one of the best-known railway officials in the Midlands, and was held in the highest esteem. A native of Leicester, he commenced his railway career at an early age, and was transferred from Peterborough to Northampton in 1859. After filling various positions in the goods offices, he was promoted to the district office in 1872, and following further rapid advancement, was appointed in 1877 chief clerk to the late Mr. William Keen. He subsequently acted in a similar capacity to the successors of that official, *viz.*, Messrs. Holt, Greenish and Blakeney. In the spring of 1912 he was appointed district goods manager in succession to Mr. H. W. Blakeney. The district he covered was a very wide one, including Northampton and Market Harborough branch (exclusive of Market Harborough), the Northampton and Peterborough branch, the main line to Harrow (inclusive), and the Oxford, Banbury, Bedford, and Cambridge branches.

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THE RAILWAY MAGAZINE.

GREAT EASTERN RAILWAY TRAIN, NEAR AUDLEY END.

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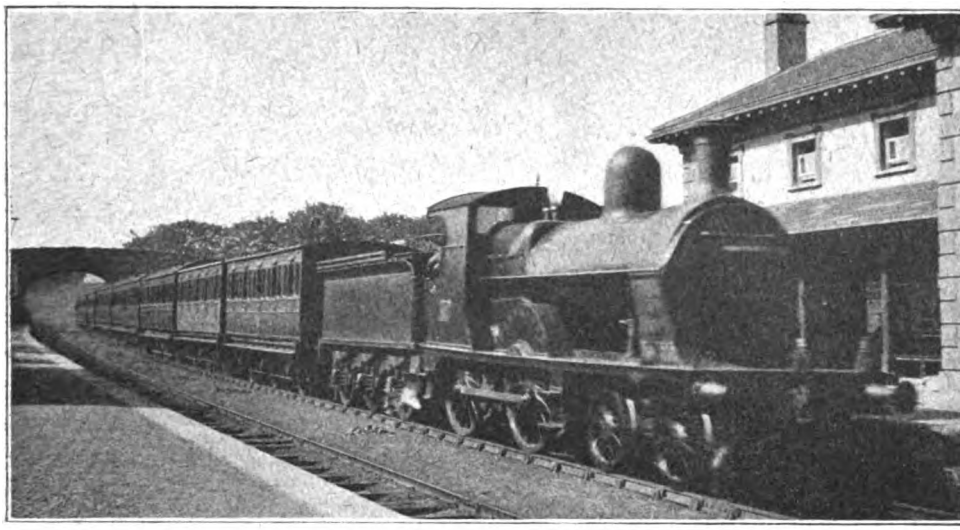

Photo] [*Herbert A. Coghlan.*

DUBLIN AND SOUTH EASTERN RAILWAY.
Express passing Shankhill. 4-4-0 locomotive, No. 57.

A Study of Irish Locomotive Types.

By J. FRANCIS.

PREVIOUS articles discussing the locomotive stocks of England, Wales and Scotland on a type and numerical basis have indicated wide interest in these aspects, and in deference to wishes expressed by several readers I have been requested by the Editor to deal with the locomotives of Ireland in a similar way. It must, however, be pointed out in introduction that it is hardly practicable to go into close detail in regard to the numerous smaller and narrow gauge lines which are found in so many parts of Ireland, as the information available is, in some cases, not sufficiently detailed to enable all individual types to be considered. Most of them are, however, of tank designs, and they can be covered in regard to numbers, if not in reference to type in every instance, and to that extent a fairly complete review can be given.

Ireland has to be credited with nearly 1,000 locomotives of all types, but as only seven lines employ tender designs that section can be covered with substantial completeness. Of locomotives with separate tenders there are 645. These are distributed as under, and for convenience the corresponding numbers of tank engines and totals are included in the same table :

	Tender.	Tank.	Total.
Belfast and County Down ..	8	22	30
Dublin and South Eastern..	30	37	67
Great Northern	170	34	204
Great Southern and Western	251	70	321
Londonderry and Lough Swilly	2	14	16
Midland Great Western ..	122	17	139
Northern Counties (Midland)	63	20	83

It will thus be seen that the Great Southern and Western heads the list, both in regard to tender and tank engines and the totals, with the Great Northern next, the Midland Great Western being the only other line having more than 100 engines of all classes. None of these lines are, moreover, generously equipped with tank engines, this being due mainly to the relatively few local passenger services of any magnitude operated in Ireland, and the general character of the goods traffic, which does not call much for tank engines, except for shunting and yard duties. Indeed, apart from the Londonderry and Lough Swilly Railway, where the two 4-8-0 tender engines are relatively incidental, their introduction being due to a particular requirement on a system which is generally more analogous to the tank engine worked narrow gauge lines, the Dublin and South Eastern is the heaviest proportionate user of tank engines (37 out of 67)

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due to its systematic local train services in the Dublin district. In fact, the only other local services worthy of comment are those in the Belfast area—Great Northern, Belfast and County Down and Northern Counties—the Great Northern Dublin–Howth and a few main line local trains out of Dublin, and the Great Southern and Western Railway's Cork suburban services.

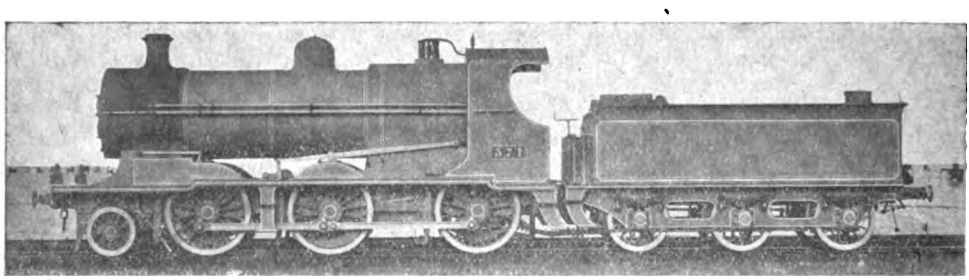
Seeing that on most of the Irish railways traffic hardly calls, as yet, for really big main line locomotives such as are now characteristic of all the leading British lines, it is not surprising that apart from the two 4–8–0 narrow gauge tender engines on the Londonderry and Lough Swilly Railway already referred to, the only main line engines with more than eight wheels are found on the Great Southern and Western Railway, consisting of Mr. Coey's 4–6–0 goods engines, and Mr. E. A. Watson's remarkable four-cylinder simple superheater 4–6–0 engine, No. 400, which formed the subject of the colour plate presented with the RAILWAY MAGAZINE for September, 1916. This at present stands alone, though as soon as conditions permit of the construction of more, they will be put in hand. Therefore the only ten-wheeled engines for the Irish standard gauge are the seven on the Great Southern and Western Railway, six for goods traffic and one for main line express work.

There are no "Atlantics" in Ireland, and the only line using the 2–6–0 type is the Great Southern and Western with 11 of this class, introduced for goods service by Mr. Coey. Consequently, it is necessary to consider the 4–4–0 as the representative main line passenger type in Ireland, and of such designs there are now quite a number of classes which rank highly even as compared with 4–4–0 engines in service in England or Scotland. Thus on the Great Southern and Western Railway Mr. R. E. L. Maunsell's engine, No. 341, *Sir William Goulding*, is the largest representative of the type, and a by no means insignificant one at that, while Mr. G. T. Glover's big superheater 4–4–0's on the Great Northern, and Mr. W. H. Morton's rebuilt 4–4–0 engine, No. 124, *Mercuric*, on the Midland Great Western (of Mr. Cusack's "Celtic" class) rank as really large and powerful engines. In regard to totals, there are 85 4–4–0 engines on the Great Southern and Western (including the Coey 6 ft. 7 in. and 5 ft. 7 in. classes), 75 on the Great Northern (including the Clifford engines and Mr. Glover's rebuilds and mixed traffic series), 22 on the Midland Great Western, and 6 on the Dublin and South Eastern. There are also some on the Northern Counties, but exact figures are not available.

But the most general tender class is, as in England, the 0–6–0. The Great Southern and Western leads with 136, the Great Northern total is 86, Midland Great Western 68, Dublin and South Eastern 11, Belfast and County Down 4, with those of the Northern Counties system not available for classification.

There are, of course, 2–4–0 and 0–4–2 engines, mostly of older types, and on the Belfast and County Down the former is still the highest passenger development. The Midland Great Western has the largest number of 2–4–0 engines, 32, the Great Southern and Western 12, Great Northern 9, Dublin and South Eastern 5, and Belfast and County Down 4. Although existent, the 0–4–2 type is only found on the Dublin and South Eastern, where there are 8 of the type.

Excluding the Northern Counties system, the totals for the respective types are therefore :



GREAT SOUTHERN AND WESTERN RAILWAY.
2–6–0 goods engine.
This is the only railway in Ireland using this type of locomotive ; the total of 11 engines having been designed by Mr. Coey.

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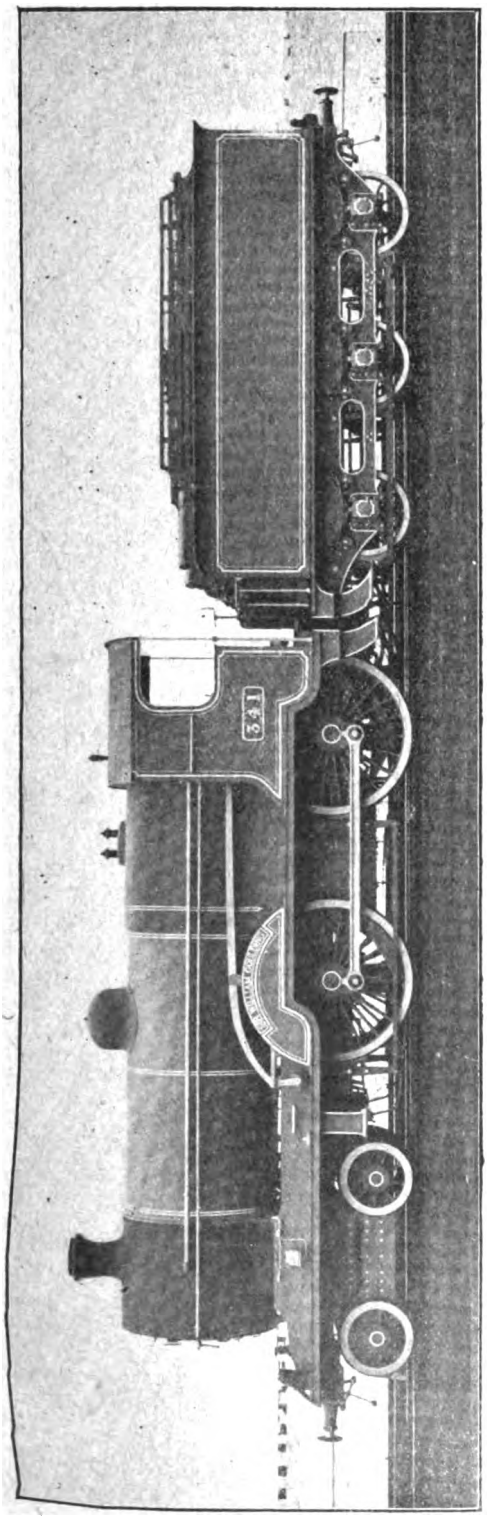

GREAT SOUTHERN AND WESTERN RAILWAY.
Mr. R. E. L. Maunsell's 4-4-0 superheater engine, No. 341.
Of a grand total for the 4-4-0 type in Ireland, 85 are owned by this railway.

4-8-0 (narrow gauge)	2
4-6-0	7
2-6-0	11
4-4-0	188
0-6-0	305
2-4-0	62
0-4-2	8

The highest number of types on any railway applies to the Great Southern and Western—4-6-0, 2-6-0, 4-4-0, 0-6-0 and 2-4-0—but the Dublin and South Eastern has four —4-4-0, 0-6-0, 2-4-0 and 0-4-2.

In regard to tank engines, however, the situation is much more complicated, for many of the Irish narrow gauge and light railways have developed tank engines to a greater proportionate degree even than in England, though of course comparison is not really practicable and would be unfair if pressed far, whether from the point of view of British railways, with their big main line passenger and goods tank engines, or on behalf of progressive Irish development to meet the traffic needs of the lines concerned.

As far as data is available for detailed analysis, the following lines are concerned, their tank engine totals being given :

Belfast and County Down ..	22
Cavan and Leitrim	9
Cork and Macroom Direct ..	5
Cork, Bandon and South Coast ..	20
County Donegal Joint Committee	21
Dublin and South Eastern ..	37
Great Northern	34
Great Southern and Western ..	70
Londonderry and Lough Swilly ..	14
Midland Great Western	17
Northern Counties	20

These account for 273 out of the total of about 360 tank engines credited to Ireland. The remainder may be stated irrespective of type in the following supplementary table :

Ballycastle (including 4-4-2 type on 3 ft. gauge)	4
Castlederg and Victoria Bridge ..	3
Cavehill and Whitewell, Belfast ..	7
Clogher Valley	7
Cork and Muskerry Light and Donoughmore Extension ..	7
Cork, Blackrock and Passage ..	4
Dublin and Blessington	4
Dublin and Lucan	1
Dundalk, Newry and Greenore (London and North Western Railway, 0-6-0 type) ..	6
Listowel and Ballybunion (mono-rail)	3
Schull and Skibbereen	4

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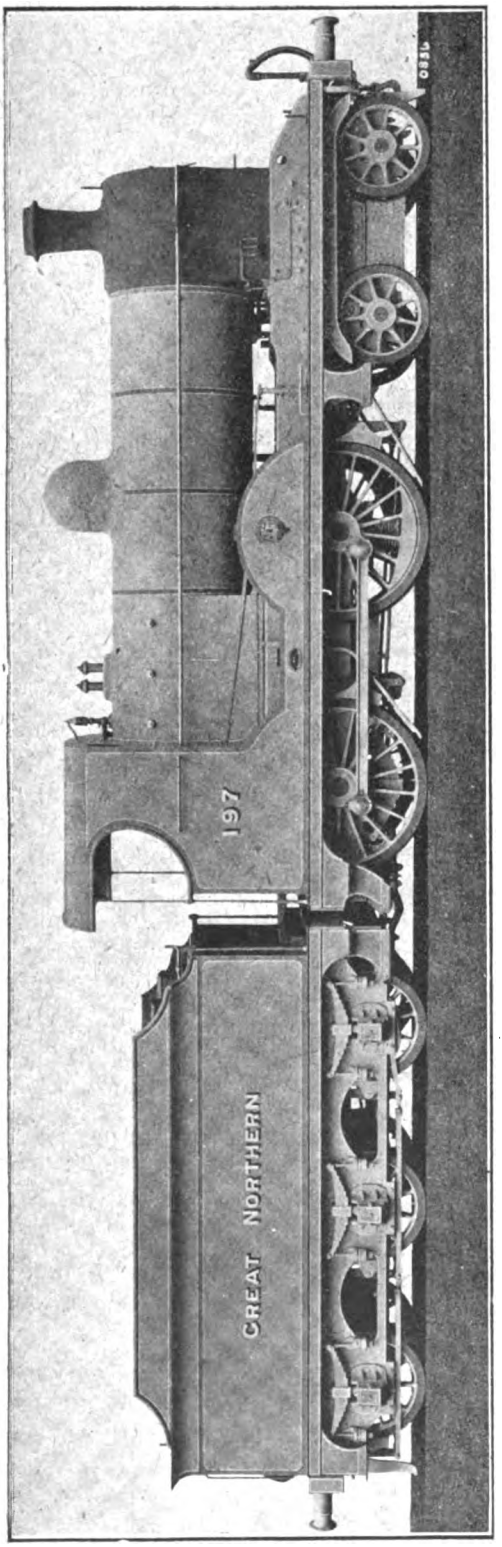

GREAT NORTHERN RAILWAY (IRELAND).
Mr. G. T. Glover's "Branch Line" superheater 4-4-0 locomotive, No. 197.
On this railway there are 75 engines of the 4-4-0 type.

Sligo, Leitrim and Northern Counties	10
Timoleague and Courtmacsherry	3
Tralee and Dingle	8
Waterford and Tramore ..	4
West and South Clare ..	11

This table gives a highest total as 11, and that the combined West and South Clare system, the next highest being the Sligo, Leitrim and Northern Counties, with 10. In the preceding table, however, the Great Southern and Western leads with 70, the Dublin and South Eastern coming next with 37 and the Great Northern with 34.

It is, however, when the types are considered individually that study becomes of most interest, as the following wheel arrangements are all involved: 0-4-0, 2-4-0, 0-4-2, 2-4-2, 4-4-0, 0-4-4, 4-4-2, 4-4-4, 0-6-0, 0-6-2, 4-6-2, 4-6-4, 0-6-4, 4-6-0, 2-6-4, 2-2-2, 4-8-0 and 4-8-4. In other words, the only ones found in England and absent in Ireland are the 2-6-2 (it is believed that even this is in use on at least one of the Irish lines not considered in detail), 0-8-0, 0-8-2 and 2-8-0 Moreover, the 4-8-4 even yet is not found in England. The 2-2-2 is a relic of early days, still used by the Dublin and South Eastern Railway.

The most numerous class is naturally the 0-6-0, but there are only 39 on the 10 lines considered in detail. These are the only tank engines on the Midland Great Western, and their total of 17 is the highest, the Great Southern and Western following with 16. The Cork, Bandon and South Coast has 5, and the Great Northern one only, while none of the other lines in the first table have any at all.

Total for the 0-4-0 type is only four, one each on the Great Northern and Great Southern and Western, and two on the Dublin and South Eastern. The 2-4-0 is found on the Cork and Macroom Direct (3), Cork, Bandon and South Coast (4), County Donegal (1), and Dublin and South Eastern (12). The 0-4-2 occurs on the Belfast and County

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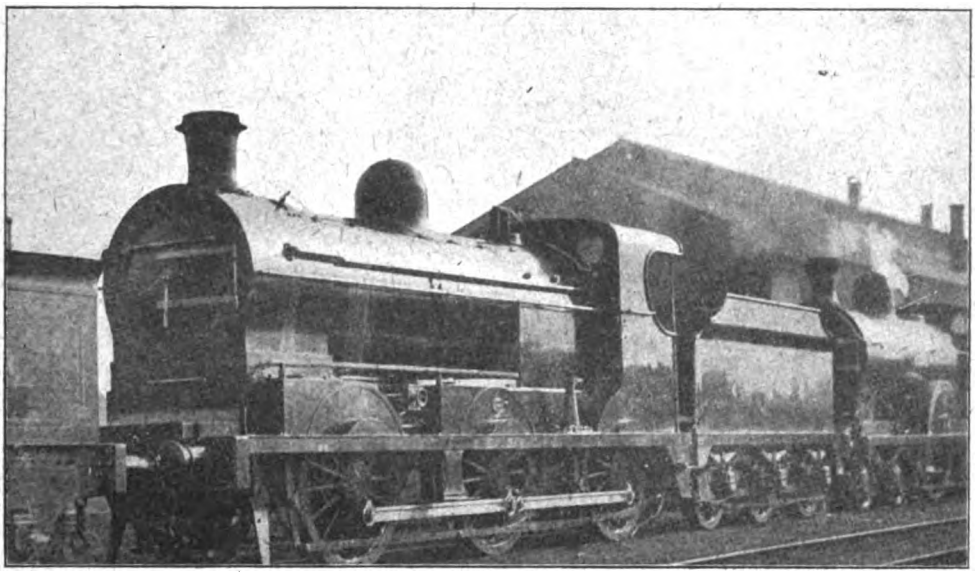
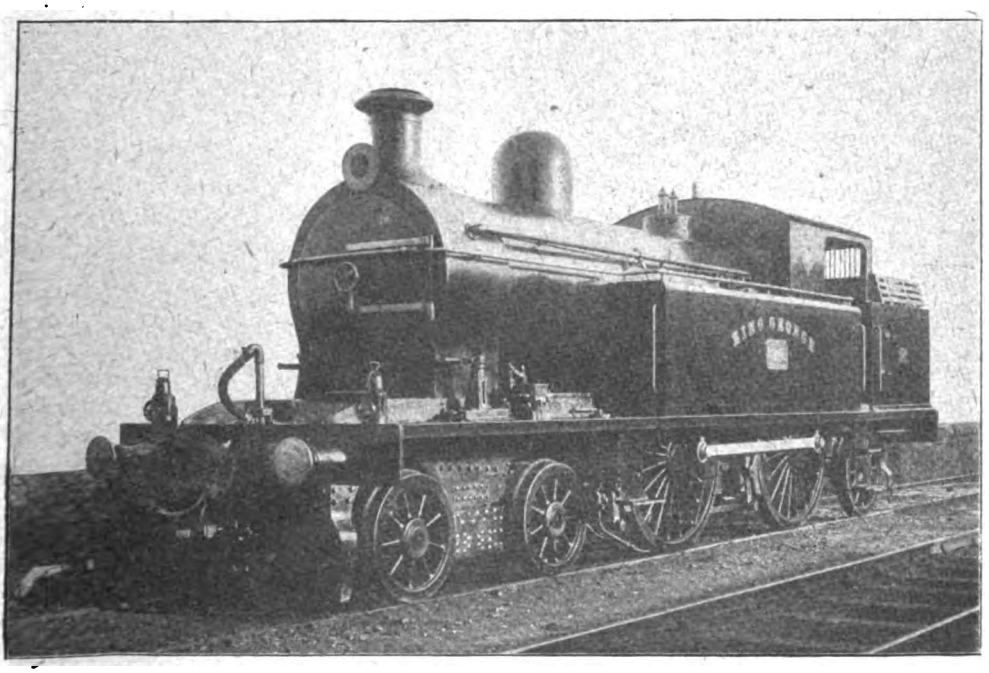


Photo] [*J. Macartney Robbins.*

GREAT NORTHERN RAILWAY (IRELAND).
0-6-0 superheater engine at Dublin.

Down (4), Dublin and South Eastern (2), and Great Southern and Western (3).

Relatively the 2-4-2 is quite a common type, the Dublin and South Eastern having no fewer than 15, the Great Southern and Western 7, Great Northern and Belfast and County Down 6 each, and 1 on the Cork and Macroom Direct. There are 13 of the 4-4-0



DUBLIN AND SOUTH EASTERN RAILWAY.
4-4-2 tank locomotive, No. 20.

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type on the Great Northern, though some of these are now being scrapped; 8 on the Cavan and Leitrim, and 2 on the Cork, Bandon and South Coast. The 0–4–4 is only found on the Great Southern and Western Railway, total 19.

A rather favourite type relatively is the 4–4–2, and this is found on both narrow and Irish standard gauge lines. The Belfast and County Down uses the type for both, total 12 engines; and the Dublin and South Eastern has four big engines of rather notable design. The Great Northern has Mr. Glover's 5 modern superheater engines; the Great Southern and Western no fewer than 14, mostly of rather old classes; and the Cork, Bandon and South Coast 3.

The County Donegal has two of the 4–4–4 type; the 0–6–2 is found only on the Cork and Macroom Direct (1), the Great Northern (4), and the Great Southern and Western (2).

The Londonderry and Lough Swilly has eight 4–6–2 tank engines, and the County Donegal four of the 4–6–4 type. The 0–6–4 type is found on the Great Southern and Western Railway (7, largely old engines used for inspection and "paymaster's" purposes), Great Northern (4, large engines for special yard work in the Belfast district), and Cavan and Leitrim (1). The 4–6–0 is used on the Cork, Bandon and South Coast and County Donegal Railways (6 each), with four on the Londonderry and Lough Swilly.

Finally there are the eight 2–6–4 tank engines on the County Donegal, one 4–8–0 on the Great Southern and Western (Mr. Watson's big shunting engine), the two 4–8–4 tank engines on the Londonderry and Lough Swilly, and the two 2–2–2 engines still remaining on the Dublin and South Eastern.

In view of the diversity of types involved, the following table will be of interest, giving the total for each type, highest number and name of individual railway, and whether narrow or standard gauge:—

Type.	No. of Railways Using.	Total for Type.	Highest Individual Total.	Railway Principally Concerned.	Gauge.
0–4–0	3	4	2	Dublin and South Eastern	Standard
2–4–0	4	20	12	Dublin and South Eastern	,,
0–4–2	3	9	4	Belfast and County Down	,,
2–4–2	5	38	15	Dublin and South Eastern	,,
4–4–0	3	23	13	Great Northern	,,
0–4–4	1	20	19	Great Southern and Western	,,
4–4–2	5	38	14	Great Southern and Western	,,
4–4–4	1	2	2	County Donegal	Narrow
0–6–0	4	39	17	Midland Great Western	Standard
0–6–2	2	3	2	Great Southern and Western	,,
4–6–2	1	8	8	Londonderry and Lough Swilly	Narrow
4–6–4	1	4	4	County Donegal	,,
0–6–4	3	12	7	Great Southern and Western	Standard
4–6–0	3	16	6	Cork and Macroom	,,
			6	Cork, Bandon and South Coast	,,
2–6–4	1	8	8	County Donegal	Narrow
4–8–0	1	1	1	Great Southern and Western	Standard
4–8–4	1	2	2	Londonderry and Lough Swilly	Narrow
2–2–2	1	2	2	Dublin and South Eastern	Standard

It will therefore be seen that whatever may be the case in regard to totals, the classification of tank engines in Ireland is a matter of decided interest.

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NEW PASSENGER STATION, PANAMA CITY.

The Panama Rail Road.

By R. W. A. SALTER.

IT is worthy of note that the Panama Rail Road mainly follows the route established by canoe and pack train in 1536, when it was customary to cross the Isthmus by boat up the Chagres river from the Atlantic to the village of Cruces, thence overland to Panama. The city of Panama had been founded in 1519, six miles east of the present city, and was the first European settlement on the American continent. The route of the railway was later adopted to run almost parallel to the course of the Canal, necessitating its re-location, which is hereafter referred to.

A concession for the building of a railway to traverse the Isthmus was granted to a Frenchman by the Colombian Government in 1847; but the concessionaire was not able to undertake the work, and in 1848 the rights were transferred to three Americans, William H. Aspinwall, Henry Chauncey, and John L. Stephens. Aspinwall, in this year, established a steamship service between Panama and San Francisco. The boom to transportation *vid* the Isthmus as a result of the discovery of gold in California at the same time caused the railway project to prove doubly attractive, and stock was subscribed in a company formed by Aspinwall. In 1849 the company was formally organised and chartered under the laws of the State of New York, with a capitalisation of $7,000,000, subscribed in 70,000 shares of common stock, $100 par value. The final ratification of the concession to the company for construction of the road was signed on April 15th, 1850. The following month work began.

This was 25 years subsequent to the opening of the Stockton and Darlington Railway, and 20 years after the opening of the first line in the United States. In 1850 a railway had been opened in Mexico, and roads were under construction in Peru and Chile; otherwise the Panama Rail Road superseded rail construction in Latin-American countries.

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At this time there was no transcontinental railway across the United States, and transportation between the Atlantic and Pacific could only be effected by slow and perilous team journey overland. A fast ship, however, consumed less time on the voyage round the Horn than the trip overland; whilst the Panama route reduced the Horn voyage by two-fifths.

The first year in which the railway was put to use in transporting passengers was 1851, when ships unable to land their passengers at the mouth of the Chagres delivered them at Aspinwall (now Colon). Passengers were conveyed thence to Gatun, where transfer was made to the boats which took them up the Chagres. The first train crossed the continent on January 28th, 1855, 14 years in advance of the transcontinental lines in the United States.

From its inception, down to the revolution in 1903, when Panama was seceded from Colombia, the railway suffered more or less by political disturbances. It always, however, enjoyed the protection of the United States through provision in a treaty between that country and Colombia; and continued its business with little loss through the 20 uprisings prior to the American occupation of the Canal Zone. The landing of United States forces was necessary on at least four occasions.

The railway has been closely associated with the Canal project. In 1881 the first French company secured control by purchasing all except 1,137 of the original authorised 70,000 shares, paying $291 for each share. It assumed control in 1883. When the receiver for the Canal company was appointed their shares were held in trust. They became the property of the second French company and were transferred by it to the United States with other property and rights. The United States paid $40,000,000 for its interests, in which the principal item was excavation for the Canal; the company's interest in the railway was reckoned as worth $6,886,300, the value of the stock being considered as par. The other shares, held by individuals living in Europe and the United States, were acquired through individual purchases.

The business of the railway rose with the activities of the French company, and fell with its collapse. Again it was strengthened in the American construction days, but has dropped since the completion and opening of the Canal. In 1882 there were 13 stations along the line; in 1883 there were 24. The

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miles run by locomotives in the two years were 193,473 and 286,435, respectively. In the latter year 90 white men and 340 negroes were employed in the railway shops.

On the secession of Panama the railway management was notified that the new republic had taken the place of Colombia in the contract of concession and assumed all obligations to the company.

During Canal construction the railway was employed as an auxiliary, reduced rates and other privileges being granted to the Isthmian Canal Commission. Upon completion of the Canal the railway ceased to be a co-carrier with steamship lines in freight handled on the Pacific and Atlantic. The management of the road has been more closely merged into that of the Canal, until its individuality has almost disappeared; but the corporate entity of the company has been preserved, and serves as a convenience in the transaction of business that might be hampered by government restrictions if carried on by the Canal Commission as such. The company's greatest business, other than the railway and steamship line, was the commissary department, which supplied the Canal employees.

Following upon government ownership came a general reduction in passenger and freight rates and charges for other services.

Throughout its existence the Panama Rail Road has proved prosperous and stable. Records show that only in one year (1893) did the company fail to make a profit. But this was at a time of great business depression in the United States, and when the railway was in keen competition with other carriers. The deficit in 1893 was $18,568.23, or .265 of 1 per cent. on the capitalisation.

At the time of concession the railway secured title to Manzanillo Island, on which it founded the city of Aspinwall, and to tracts of land along the road and plots in Panama. These holdings have steadily increased in value and served to establish the railway a firm place in the life of the Isthmus.

During its construction the road was worked, and has since been worked, by Americans, who have employed for unskilled labour principally natives of Panama and negroes of the West Indies. Men of all nations have contributed to the enterprise. During the construction negroes were imported from Africa as well as the West Indies; a few Chinamen came from the Orient; and a considerable number of Irishmen and Scandinavians were employed. Even through the French *régime* directing and operating officials were from the United States of America.

Yellow fever and other tropical diseases contributed to the hardships of building and operation.

A heavy increase in traffic during the period of Canal construction necessitated corresponding expenditures for improvement.

PASSENGER TRAIN, PANAMA RAIL ROAD DEPÓT, CITY OF PANAMA.

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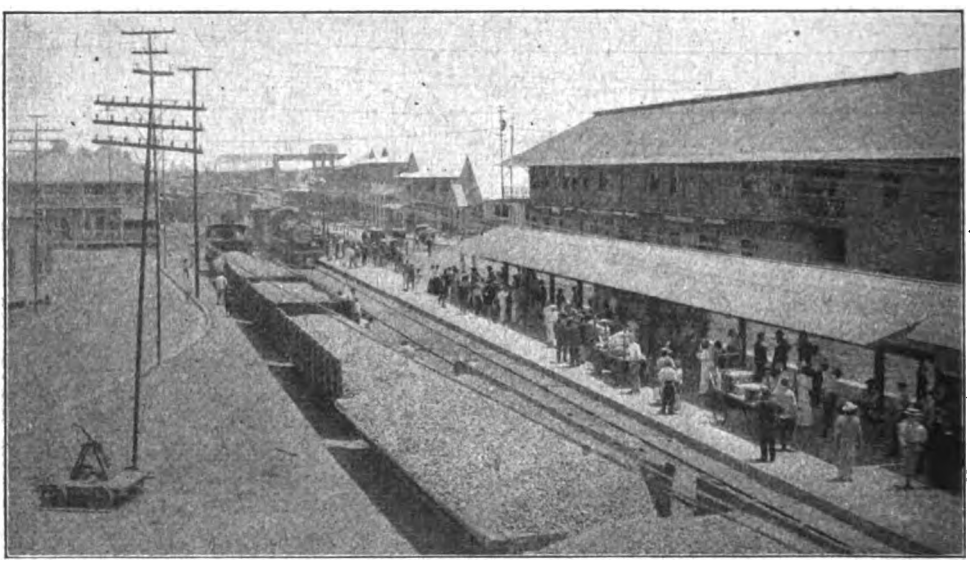
and extension. Through 1906, 1907, and 1908, 34·77 miles of a line 47 miles in length were double-tracked.

Perhaps the working of the commissary department is of hardly sufficient interest to be mentioned, but it served as a source of revenue. The steamship lines have paid, but principally in the matter of cheaper conveyance of Canal supplies and in maintaining its independence against the tendency of contributary carriers to allow it only the smallest percentage of rates for the through haul.

Freight rates are made up in two sections: the purely local, covering Isthmian traffic only, and the through rates, covering shipments in connection with ocean carriers. The latter involves a division of rate between the railway and the steamship line, and such are affected by the conditions of the connecting carrier. The local tariff is made up on a classification into five main classes, and the rates are based on the combination of class, weight, and distance carried. A 50 per cent. drawback is granted on shipments of native produce of Panama. In the early days a rebate of one-third was allowed on such products, but a convention to make a return of one-half the amount paid, instead of one-third, went into effect on July 1st, 1892, and has remained in force since. The classification of commodities, which is standard for railways in the United States, under the approval of the Interstate Commerce Commission, will probably be in effect by the time this article appears in print.

Passenger rates are 5 cents per mile for first-class transportation, and 2 cents per mile for second-class. Employees of the railway, the Canal, and other branches of the Government service are given a reduced rate of 2½ cents per mile for first-class, one-half of the regular fare. Mileage books, good for 1,000 miles of first-class transportation may be purchased by the public at large for $30. A large part of the passenger traffic is in employees of the Government, travelling on official business or complimentary passes. To cover such the Canal Commission pays the railway a lump sum of $12,000 per month.



PANAMA RAIL ROAD STATION AT CRISTOBAL.
Commissary in background.

The topography of the Isthmus consists of a coastal plain on the Atlantic side, ascending to the elevated districts, and then a narrower coastal plain along the Pacific. The route selected for the Panama Rail Road crossed a low pass, which is the narrowest part of the Isthmus, the distance from shore to shore being hardly more than 30 miles. The Isthmus lies in the shape of an arc, and the railway runs from north-west to south-east.

The line of the railway was run up the Chagres river valley to the nearest approach to the Culebra Pass, above Matachin, where the Chagres valley turns sharply to the east;

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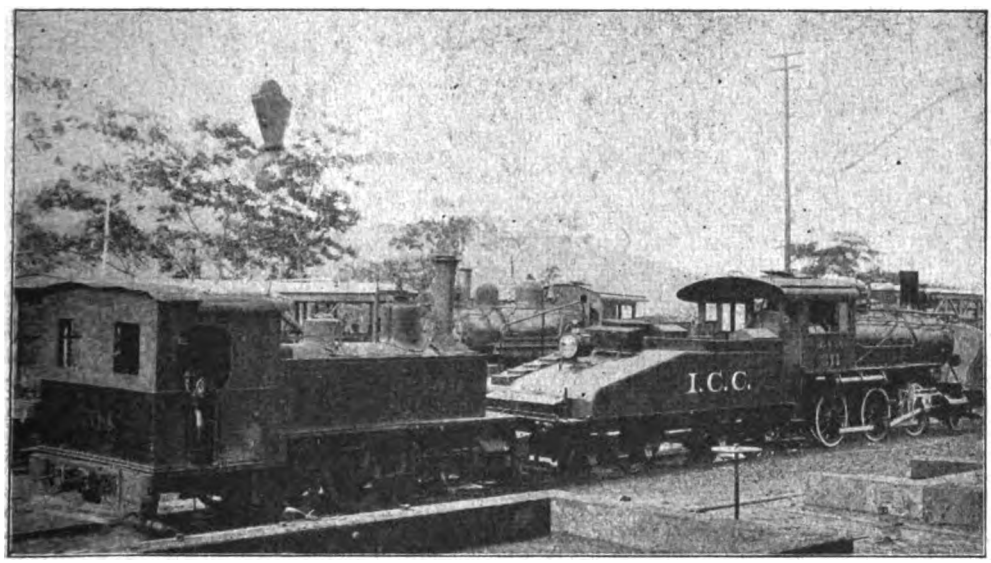
thence up the valley of the tributary Obispo, over the saddle at Culebra, and down the Pacific slope, following the valley of the Rio Grande. On account of the lack of harbour facilities where the river empties into the sea, the railway did not follow the Chagres valley from the mouth; but the terminus was made Manzanillo Island, which is practically a peninsula, jutting out from the shores of Limon Bay, where there is a commodious deep-water harbour. The line was run across the marshy coastal plains to Mindi; thence on firmer land, but practically at sea-level, to Gatun, a village on the Chagres. From Gatun the course proceeded about 23 miles up the valley to the entrance



RE-BUILT BELGIAN LOCOMOTIVE (NO. 704) AND 300-CLASS AMERICAN LOCOMOTIVE (BALDWIN) NO. 311.

of Obispo valley. Matachin was over halfway across the Isthmus, and the rise in reaching it from the Atlantic terminus was from 2 to 72 ft. above sea-level; the average ascent was less than 2½ ft. per mile.

The summit elevation in the Culebra Pass was 263 ft. above sea-level; from Matachin to the saddle was 6¼ miles. Beyond the pass, on the Pacific slope, the road sharply descended the Rio Grande valley, reaching an elevation of 30 ft. above sea-level at Miraflores, 5¾ miles beyond the summit. The Rio Grande debouched into the Pacific at La Boca, about 1½ miles west of Panama; the railway departed from the riverside near Corozal, took a cut through the low hills at Diablo to the flat land flanking the Corundu, a tributary of Rio Grande, and crossed the swampy area on an even grade to the city of Panama at an elevation of 20 ft. above sea-level.

In construction the most difficult sections occurred in the swamp between Aspinwall and Mindi. Above San Pablo, over the divide, and to Panama, the land is firm, and presents no more than the usual features of grading, etc.

The route of the railway being the easiest crossing the Isthmus, it was selected as the route of the Canal, which displaced it from its right-of-way.

The length of the completed line from Colon to Panama is 47 miles 3,221 ft., only 201 ft. more than the original line completed in 1855; the new road, however, includes an extension of about 500 ft. at Colon. The maximum grade on the new road is 1¼ per cent., with compensation for curvature. The maximum curvature is 7 degrees.

The formation of the Gatun Lake flooded the old line between Gatun and Bas Obispo, and this section was removed in anticipation of the rise of the waters. The line between Las Cascadas, the station next Bas Obispo, and Pedro Miguel remains in operation as a branch-line. At the latter station it joins the re-located main-line, and in doing this

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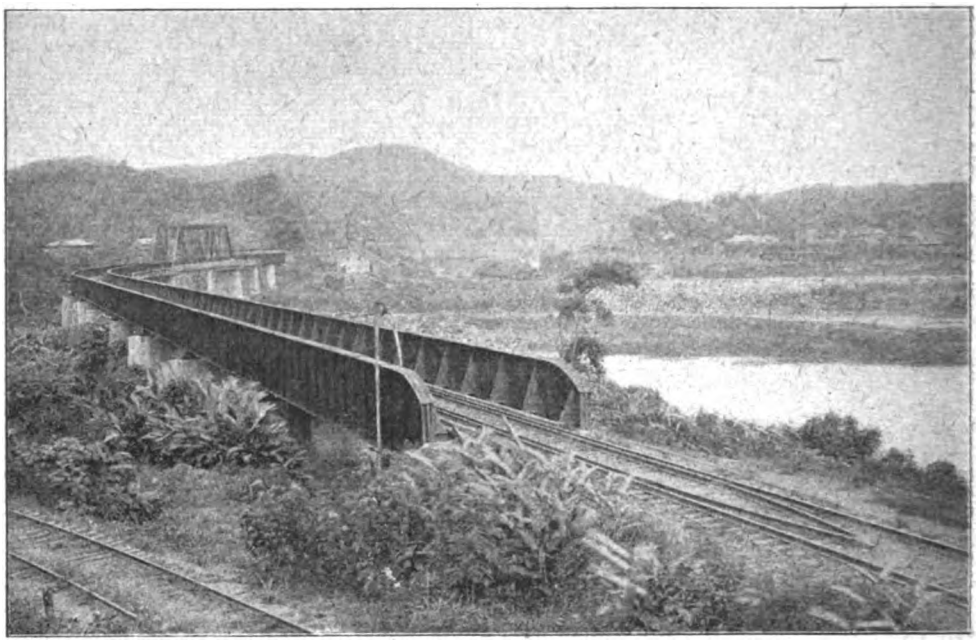

GAMBOA BRIDGE, LOOKING SOUTH.
Bridge spans Chagres Valley at north end of Culebra Cut, and is ¼ mile long.

crosses the Canal at Paraiso by means of a swing pontoon bridge.

In the original construction of the railway from Aspinwall to Gatun the rails were flat iron bars, laid on stringers. From time to time, with the development of traffic, new and heavier rails have been substituted.

The gauge of the Panama Rail Road is 5 ft. There are two reasons: first, when the road was built American gauge had not been standardised; second, the road was for heavy traffic. Owing to isolation the odd gauge has presented no operating difficulties.

Not only has the Panama Rail Road no connections, but until recently it was the only railway in the republic. Three years ago the Government of Panama built the Ferrocarril Nacional de Chiriqui (42-in. gauge), extending from the port of Pedrogal, on the Pacific, to Boquette, 50 miles inland. Its nearest point is 180 miles from the Panama Rail Road.

Under the original concession, later perpetuated, the Panama Rail Road was granted a monopoly of transisthmian rights. Except for the Panama Canal the railway is the only means of traffic from coast to coast in Panama. There are at present no through highways; the nearest approach to them are the roads built by the Isthmian Canal Commission. These extend from Colon to Gatun, and from Panama to Gamboa, but between them is a gap of 23½ miles, only crossed by the railway.

Throughout the history of the Panama Rail Road equipment has been manufactured in the United States. As a rule it was kept in good running order. At the time of the American occupation of the Canal zone the 24 main-line locomotives had been built in 1883 by Cooke, of Schenectady, N.Y., and weighed about 40 tons, with driving wheels 60 in. in diameter, a composite passenger and freight type. Although they had been in service for 20 years they were reliable, and made a fair speed.

Introduced in 1885, the Westinghouse automatic air-brake system was subsequently adopted for all main-line stock.

The locomotives now in use on the main-line are Mogul 2–6–0, built in 1909 by the American Locomotive Works, and purchased at a cost of $12,550 each. The cylinders are 19 by 26 in., and driving wheels 63 in. diameter. They weigh 238,200 lbs. each, and have a hauling capacity of 3,843 tons on level line. A velocity of 60 miles an hour can be attained, but the time-tables do not

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call for such speed under normal circumstances.

The locomotives are relatively light, but this is on account of light rails and instability of sections traversing swamp areas, and because the local conditions do not require heavy engines. Each year from 4,000 to 8,000 of the most durable hardwood sleepers are placed in track maintenance.

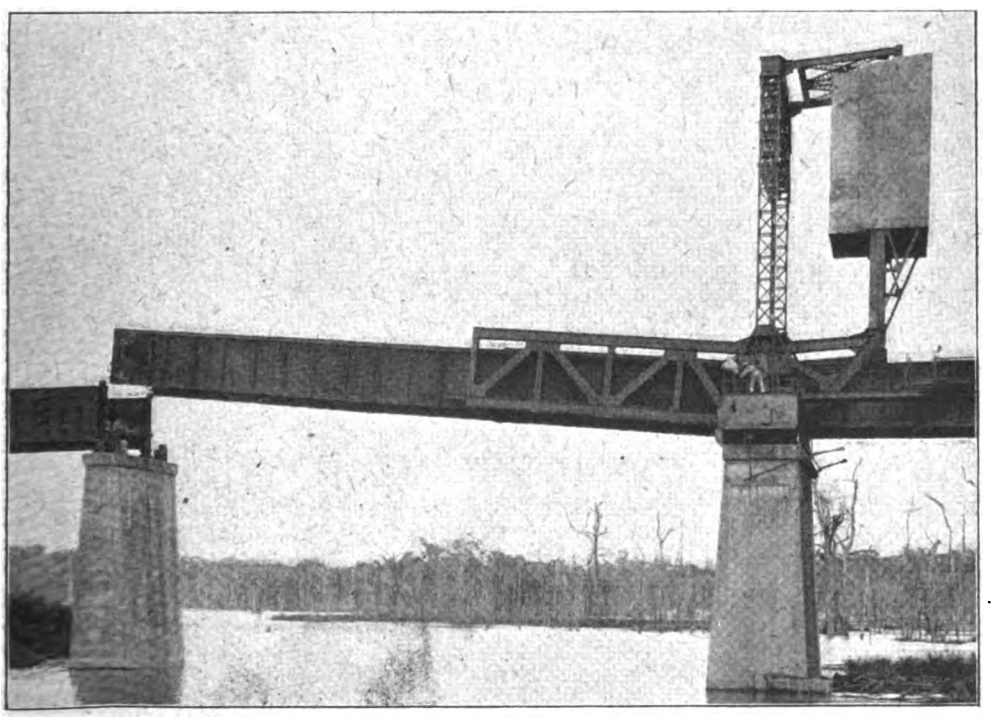
To the difficulties of maintaining the old line was added that of floods. Each rainy season produced a washout. In December, 1906, 15 miles of line were submerged to a depth from 1 to 8 ft., which caused a three days' suspension of traffic.

The bodies of passenger cars are built of wood, although modern steel trucks and underframes are the rule on new equipment. Two hundred steel flat cars are in service. The first-class passenger coaches are 72 ft. in length, fitted with double rows of reversible rattan seats, and with large windows, which make them well adapted to travel in the tropics. They are lighted with oil lamps; there is little passenger traffic during the night, however. The second-class passenger cars have the same general exterior appearance as the first-class, but the seats are longitudinal benches on either side.

Passenger trains are hauled back and forth across the Isthmus without being turned around, the locomotives being turned, and with the observation car (if attached) shifted to the other end. The first-class accommodation is always on the south end of the trains, baggage and hospital cars in the centre, second-class at the north end. The stations are designed with the same directional divisions, the first-class sections being always at the south end.

On November 19th, 1914, the Panama Rail Road, under a policy of diverting all possible traffic to the Canal, ceased to act as a co-carrier with the steamship lines operating to the Isthmus. Its present business consists principally in handling local freight between Panama and Colon, and in carrying passengers, and the not inconsiderable transportation of material and supplies for forces of the Canal and Army.

Before the advent of the Canal the primary business of the road had been handling goods and passengers between the seaboards connecting with the steamship lines on the



BASCULE BRIDGE ACROSS GUTUN RIVER.
Lift span just starting to open.

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Atlantic and Pacific. Even in the days of Canal construction this was the largest and most remunerative business; in 1906 the through traffic was 50·83 per cent. of the whole tonnage, and this was a year in which coastwise traffic was diminished by the great earthquake in San Francisco. A considerable reduction in coastwise traffic *viâ* Panama was caused in 1908 by the completion of the Tehuantepec and Guatemalan railways, and the opening of the port of Salina Cruz, 1,200 miles nearer than Panama to the United States. The proportion of Canal tonnage handled by the railway for the construction of the Canal is indicated by the figures of the fiscal year ending 1909, when business for the Canal Commission was 53·23 per cent. of the total tonnage.

In connection with its business as a connecting carrier between the steamship lines, the Panama Rail Road has maintained wharves and lighters to expedite the handling of cargo, and these have proved a source of profit. From the beginning there were piers at Aspinwall (selected terminus on account of deep water); but at Panama cargo was transferred to the trains by means of lighters, as the ships had to anchor five and six miles out.

In February, 1897, the Panama Rail Road contracted with the second French canal company for the building of a steel and concrete pier at La Boca. This was placed in service in the latter part of 1899 (formally opened January 1st, 1901), and gave great impetus to traffic. The surplus earnings of the railway during the period of Canal construction have been largely devoted to the building of modern terminals of the Canal at Cristobal. These were operated by the company, and in the fiscal year their operation yielded a net profit of $49,274.80.

In the preceding survey of the Panama Rail Road, which is in reality but a page from its eventful history, the writer has endeavoured to cover within limited space the most essential happenings. Of the terrible tropical diseases which confronted the builders, and of the many other hardships incidental to the establishment of efficient rail communication in a tropical climate, little or no mention has been made. Thanks are due to Mr. W. P. Copeland, Acting Executive Secretary of the Canal Zone, for his valuable assistance and kindness in furnishing the accompanying illustrations for reproduction.

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

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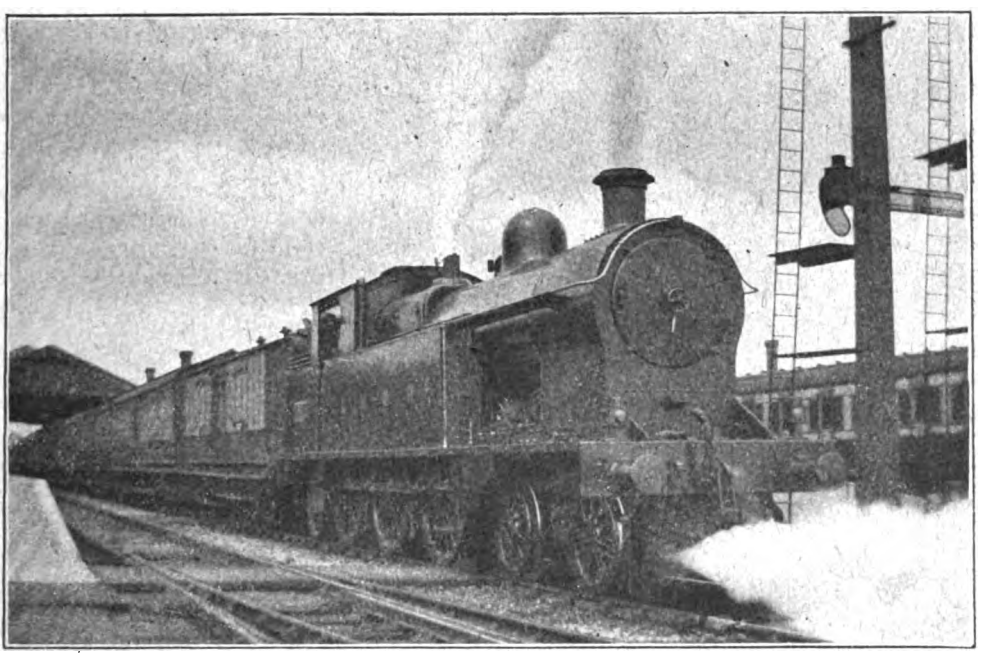
Tank Engines on Fast Trains.

THE 4–6–2 type tank locomotives of the London and North Western Railway are given a fair amount of fast passenger train working in the course of their ordinary duties, and some of the trains coming within this category and hauled by them are of considerable weight. The combination of two 20 by 26 in. cylinders and six-coupled wheels provide ample powers for hauling heavy loads, and the engines are essentially adapted for handling stopping traffic where frequent restarts have to be made; but the relatively small size of the coupled wheels, namely, 5 ft. 8½ in. diameter, is somewhat against them when it comes to be a matter of high speed work. In spite of this, however, they are able to reach high velocities and they do remarkably well on long up-grades.

One of this class, No. 96, has for some time past been working the 7.40 a.m. slow train from Euston to Bletchley. This train stops at Willesden and Watford, being allowed 32 min., including the stop at Willesden for getting clear of Watford. The train then calls at all stations to Bletchley, where it is due at 9.12 a.m. On the arrival of the train at the latter station the engine is detached and waits on the "pilot track" until 10.35, when it goes forward with a train calling at all stations to Rugby.

The return trip is made with a fast train calling at Northampton, Bletchley and Willesden. This is the



LONDON AND NORTH WESTERN RAILWAY.

4–6–2 tank engine, No. 96, leaving Bletchley with 2.19 p.m. train for Willesden and Euston only. Load = 320 tons. Due Willesden, 41½ miles, 3.6 p.m.

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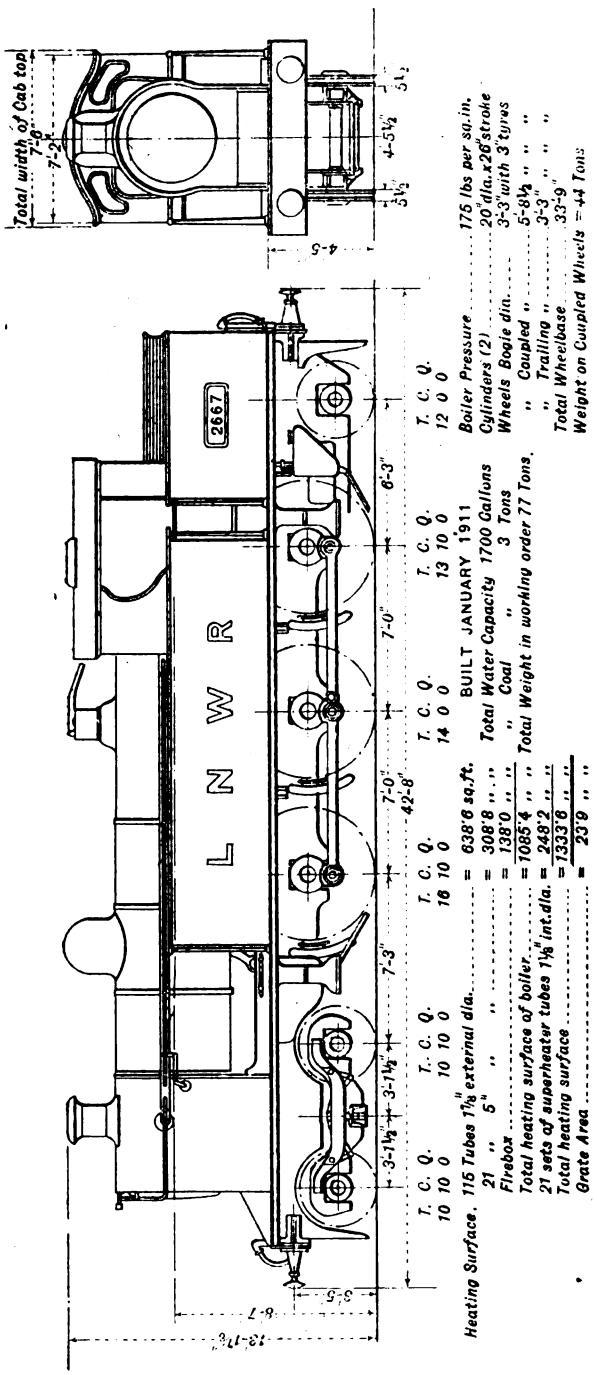

Heating Surface. 115 Tubes 1⅞" external dia.	= 638·6 sq.ft.	T. C. Q. 10 10 0
21 " 5" "	= 308·8 " "	T. C. Q. 10 10 0
Firebox	= 138·0 " "	T. C. Q. 16 10 0
Total heating surface of boiler	= 1085·4 " "	T. C. Q. 14 0 0
21 sets of superheater tubes 1⅛" int.dia.	= 249·2 " "	
Total heating surface	= 1333·6 " "	
Grate Area	= 23·9 " "	

BUILT JANUARY 1911

Total Water Capacity	1700 Gallons
Coal "	3 Tons
Total Weight in working order	77 Tons.

Boiler Pressure	175 lbs per sq.in.
Cylinders (2)	20 dia. x 26 stroke
Wheels Bogie dia.	3'-3" with 3" tyres
" Coupled "	5'-8½ " " "
" Trailing "	3'-3" " " "
Total Wheelbase	33'-9"
Weight on Coupled Wheels	44 Tons

1.17 p.m. from Rugby, a long-distance train, due Euston at 3.20 p.m. The first section, namely to Northampton, 19 miles, is covered in 24 min., and after this the train runs to Bletchley, 19 miles, in 26 min. Leaving Bletchley again at 2.19, the run of 41¼ miles to Willesden is covered in 47 min., non-stop, the first 15 miles, *i.e.*, to Tring Summit, being on a continuously up-grade with approximately 6 miles of 1 in 333. On a recent trip the engine referred to, namely, No. 96, with a train of 310 tons weight behind it, cleared Tring from the start at Bletchley in 21 min., and arrived at Willesden punctually, thus having covered the last 26¼ miles in 26 min., or an average of just over 60 m.p.h.

The photograph on page 85 shows the engine just starting from Bletchley. It is one of the latest of its class and finished in the present-day style, namely, all-black, without lining of any kind. The total weight of these engines is 77 tons, with 44 tons of adhesion when the tanks are full. The total heating surface, including the superheater, is 1,333·6 sq. ft., boiler pressure 175 lbs. per sq. in., and grate area 23·9 sq. ft. The driver's sheet for that particular week showed that the average weight of the trains hauled by this engine had been 275 tons, with a maximum of 320 tons, and time had been kept on four out of the six daily journeys, with one late arrival of 4 min. and another of 6 min., neither being, however, due to locomotive causes.

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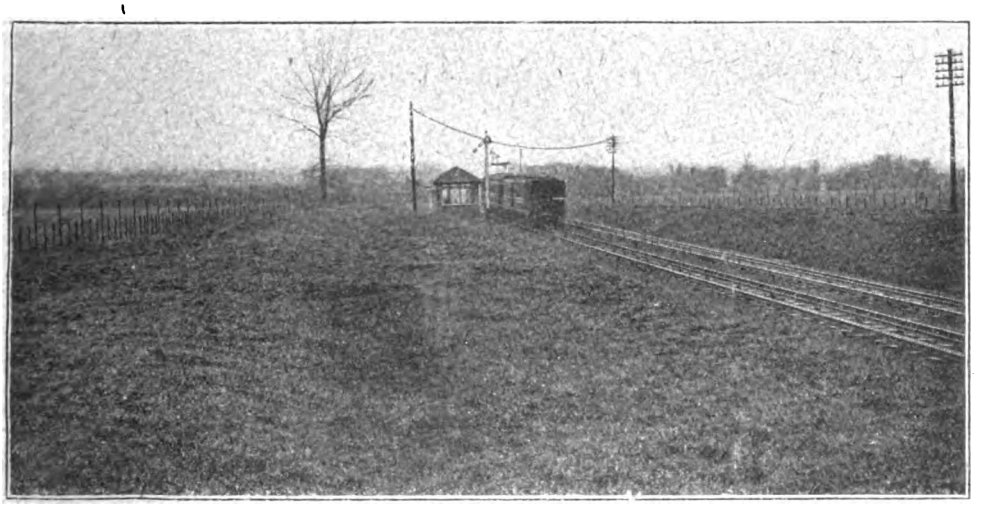
METROPOLITAN RAILWAY WOMEN WORKERS EMPLOYING THEIR SPARE TIME IN GATHERING WILD FLOWERS FROM RAILWAY EMBANKMENTS FOR DISTRIBUTION AMONG THE LONDON MILITARY HOSPITALS.

War-Time Cultivation of Railway Vacant Land.

METROPOLITAN RAILWAY ENTERPRISE.

DURING the past winter and spring the members of the staff of the Metropolitan Railway Company, in common with the rest of the community, were brought face to face with the serious problem of a food shortage by reason of the restriction of foreign imports—a consequence of the war—and the smaller crop of British-produced potatoes—a result of the adverse weather conditions of the spring of 1916.

Paternal, as well as commercial, the powers that be on the Metropolitan Railway took steps, which everyone will readily admit were at once both wise and patriotic, to make quite sure that similar risks should not



METROPOLITAN RAILWAY VACANT LAND BEFORE IT WAS PUT UNDER CULTIVATION.

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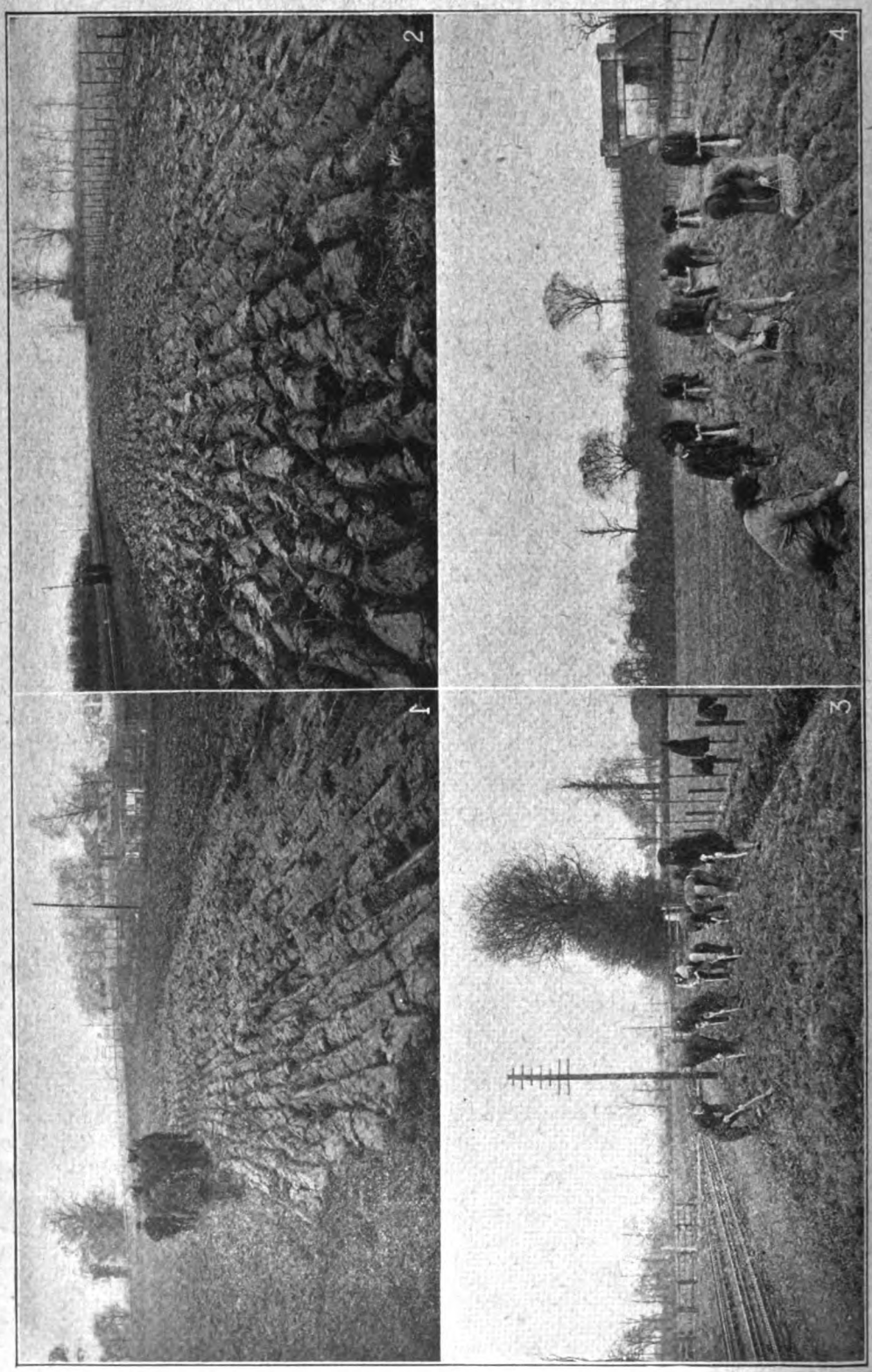

WAR-TIME CULTIVATION OF METROPOLITAN RAILWAY VACANT LAND.

1. Ploughing. 2. A long stretch ploughed. 3. Digging vacant land. 4. Planting Seed Potatoes.

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"EARTHING UP POTATOES" WITH MACHINE CULTIVATOR.

again be taken, so far as they were able to obviate such a situation, wherein their staff was concerned. A well-fed and contented staff is one of the most valuable assets a railway company can possess.

Into the capable hands of Mr. John Wardle, the company's Commercial Manager, this highly important matter was placed. In itself this was an augury of success.

Between Harrow and Uxbridge there was much waste uncultivated land lying useless beside the railway lines. An annual crop of dock weed, coarse grass and wild flowers was its only contribution to the needs of animated nature, human or otherwise.

WOMEN RAILWAY BILL-POSTERS ENGAGED IN CULTIVATING VACANT LAND.

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To this waste Mr. Wardle's attention was quickly directed, and now in the summer of 1917 no fewer than fifteen acres are under cultivation and producing crops.

In December last a plough was purchased; a ploughman was obtained from the Engineer's Department, and the work of preparing the land for cultivation by manual labour was put into operation. By so doing the Commercial Department of the Metropolitan Railway practically adopted, as part of its policy, the cultivation of the company's vacant land; having put its hand to the plough, it is not a department at all likely to turn back!

The staff employed in the cultivation of the vacant land includes a number of women who are the company's bill-posters. Right well have these worthy women taken to their strange duties, and no small mede of praise is due to them for the excellent manner in which they have adapted themselves to, what is to them, an entirely new kind of occupation. Other workers on the vacant land are men drawn from the various departments of the Metropolitan Railway service. The men are those who have volunteered to do the work of cultivators in their otherwise leisure hours, and they are paid for their labour.

The whole of the staff engaged, entered upon the enterprise with an enthusiasm worthy of its importance and patriotism. Rough as was the land, it was quickly got into good condition, and during the spring 14 tons of seed potatoes were planted. About half-an-acre of land was sown with turnip seed, and early in July a portion of the crop was lifted, forming the first-fruits of the enterprise—if turnips may be so-called.

In addition, one rood of land was sown with sugar beet, as an experiment. The idea here, is first to test beet growing on the company's land and then, providing the results are satisfactory, promote and develop its cultivation in the near-to-London agricultural neighbourhoods served by the Metropolitan Railway.

To market the produce from the vacant lands, the Commercial Department of the Metropolitan Railway has no intention of entering into competition with Covent Garden, or the vegetable trade, either wholesale or retail, but to restrict the sale of the produce to the members of the company's staff, who, during the coming winter, it is thereby hoped, will be ensured with a steady and sufficient supply of that warmth and energy-giving vegetable—the popular potato.

While the railway staff is to be congratulated upon having a Commercial Department to look after and care for its material comfort in this fashion, a word of commendation must be bestowed on the department itself and its chief, Mr. John Wardle, together with his Assistant, Mr. E. Charles Short, for its accomplishment of such great achievement in so small a period of time. It speaks well for the ever-ready state of the organisation of the Metropolitan Railway Commercial Department that it was able, at practically a moment's notice, to put into operation—and successful operation—a scheme so far removed from the sphere of its customary activities.

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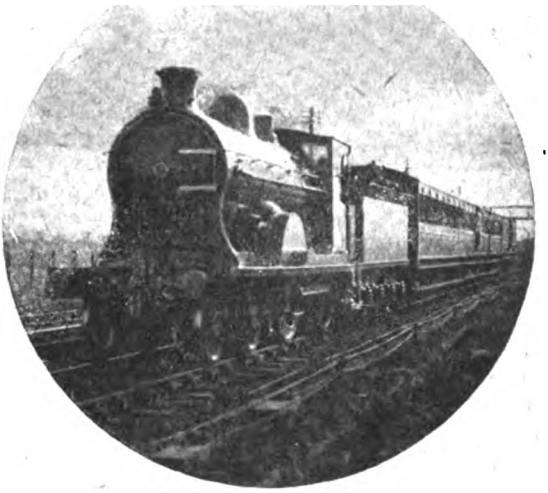
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*Tom M. L. Neish.*
CALEDONIAN RAILWAY.
4.20 p.m. "slow," Perth to Aberdeen, near Ardler.
4-4-0 locomotive, No. 140.

A PARAGRAPH in the May RAILWAY MAGAZINE containing certain details from a paper read at the Institution of Locomotive Engineers relative to boiler construction, appears to have raised difficulties in the mind of a reader, who writes:—"Mr. Burnett laid down a rule or rules with regard to boiler construction that the fire-grate area should be in proportion to the diameter of the cylinders, and the total heating surface in proportion to the fire-grate area. Now take an 18-in. diameter cylinder, and apply the rule, *i.e.*, multiply the square of the diameter by the constant ·055. The grate area would then be 17·8 sq. ft. and the total heating surface (multiplying the grate area by 6 to find firebox heating surface, and 60 for tube heating surface) 1,175 sq. ft. But do locomotive engineers adhere to such rules? If you take a Midland Railway 2-4-0 passenger tender engine, the figures agree fairly closely with those obtained above, *e.g.*, 18 in. cylinders, 17·5 sq. ft. of fire-grate and 1,202 sq. ft. of heating surface. But the 0-6-0 goods engines of the same company, with 18 in. cylinders, have a fire-grate area of 21·1 sq. ft. and a heating surface of 1,428 sq. ft., which according to Mr. Burnett's rules should be more than sufficient for 18¾ in. cylinders. With the engines of most other railways the result is the same. Also is it not a mistake to take the diameter of the cylinder only and neglect the stroke in the rule, as thus you would give the same grate area and heating surface to one engine having 18 in. by 24 in. cylinders and to another having 18 in. by 30 in. cylinders? Would it not be better if the rule were to make the grate area in proportion to the *volume* of the cylinders?"

I do not imagine that it was Mr. Burnett's intention to lay down a hard-and-fast rule as regards the relation of these dimensions, and, even if he had done so, it is notorious that every locomotive designer is, within certain limits, a law unto himself in these matters. It was rather, I think, his desire to pass on some *formulæ* that might be useful to students of locomotive practice. And in doing so, it may be taken as probable that the rules he laid down were intended to give the *minimum* desirable area in each case. For it is quite obvious, from a brief consideration of the dimensions of large modern locomotive types, both passenger and goods, that the tendency is towards a much greater steam-raising capacity than would be obtained by the use of this rule. For example, the Great Northern superheater "Atlantics," with 20 in. by 24 in. cylinders, should by the rule have a fire-grate of 22 sq. ft. and a heating surface of 1,452 sq. ft., whereas the actual figures are 31 sq. ft. and 2,053 sq. ft. respectively, or over 40 per cent. higher. If the superheater be included, the total heating surface is no less than 2,396 sq. ft. But the Great Northern Railway tradition of moderate-sized cylinders in conjunction with very ample firebox capacity and

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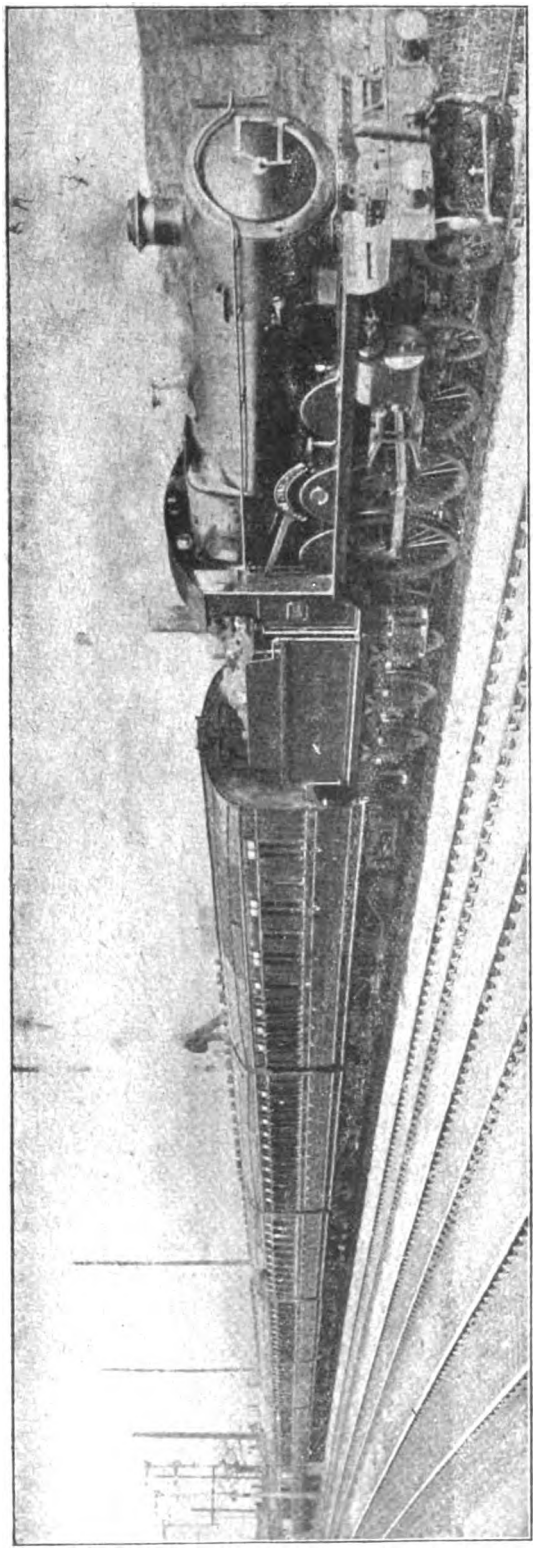

[F. E. Mackay.

GREAT WESTERN RAILWAY.
Plymouth express, passing Acton.
4-cylinder 4-6-0 "Star" class locomotive, No. 4035, *Queen Charlotte*.

Photo]

steam-raising surfaces is a well-known one. At the other extreme we have, say, one of the rebuilt Lancashire and Yorkshire Railway superheater 4–4–0 engines, with cylinders of the same diameter, but only 18·8 sq. ft. of grate and a total of 1,096 sq. ft. of heating surface, superheater included, or 886 sq. ft. without the latter. Average these two extremes, and you get a fire-grate area of 25 sq. ft., and a heating surface, not including superheater, of 1,470 sq. ft., which is fairly close to, although still above, the figures calculated by rule.

In the majority of cases, however, and especially as regards 4–4–2 and 4–6–0 engines, the grate area and heating surface are considerably larger than would be indicated by Mr. Burnett's rule, and this confirms the opinion that such a rule is intended to give the minimum dimensions of these parts consistent with the real efficiency of the engine. As regards the question my correspondent raises concerning the use of the volume of the cylinder in the formula in preference to the stroke, it must be remembered that the stroke determines the leverage obtainable at the crank of the engine rather than having any vital relation to the steam supply, and it is not, therefore, essential that the stroke should be taken into consideration. At the same time, length of stroke generally bears a proportion to diameter of cylinders that does not vary outside moderate limits, save in the case of such exceptional dimensions as the 30 in. so prevalent on the Great Western Railway, or the modest 24 in.—in contrast to the size of the engine concerned—of the Great Northern "Atlantics." But a rule of this character must not be taken as being in any way inflexible in application.

It is now some months

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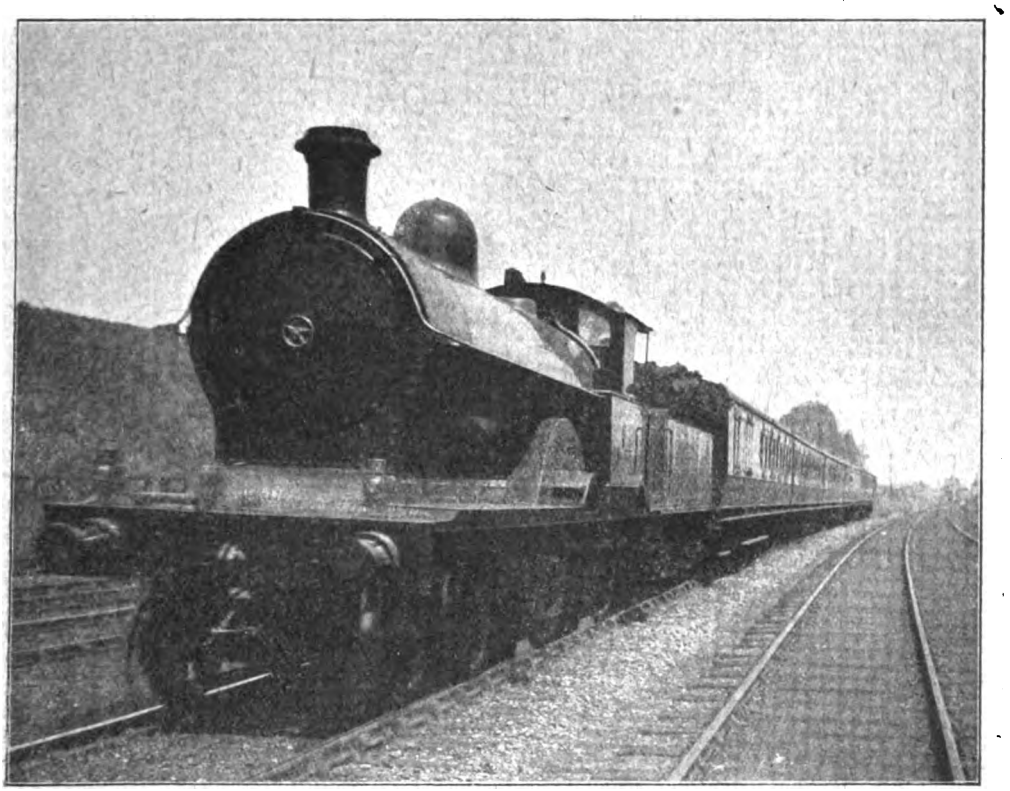
since I devoted any attention to locomotive work on the Great Central Railway, and as I had enjoyed several excellent runs on that line immediately prior to the decelerations of January last, I will take this opportunity of giving them publicity. Two were made through to Manchester on the 3.15 p.m. *ex*-Marylebone, and a more comfortable and expeditious journey one could not have wished for, the commodious character and smooth running of the modern Great Central Railway 60-ft. Cheshire Lines "Punctual" express to Liverpool, was an added source of interest. Incidentally, I should imagine that, in due consideration of the importance of the trains concerned, this must have been, while it lasted, the closest "booked" main line connection this country has ever seen, and was the more astonishing, in that the London train was at the conclusion of a journey of over 200 miles. From personal observations at the Manchester end, however, I believe that the connection was not often severed,



Photo] [*J. G. Irving.*

LONDON AND NORTH WESTERN RAILWAY.

Up Birmingham express near Bushey.
4-4-0 Locomotive, No. 1617, *Hydra*, "Precursor" class.

coaches being beyond praise, while the restaurant car service is to my mind a model of the facilities that should be afforded by a restaurant on wheels. But that by the way. These runs were made, of course, subsequent to the introduction of stops at Leicester and Nottingham, and the tightness of the schedule throughout, especially in its concluding stages, with the somewhat unique final "one-minute" connection—7.29–7.30 p.m.—at Manchester (Central) with a although the Cheshire Lines train was occasionally kept waiting up till about 7.35 p.m.

On the first of my two runs, however, we were in before time—that is, if the clock at Marylebone was correct, as there was a discrepancy of a full minute between its time and the times of the clocks further down the line. The load was four of the large 60 ft. vestibuled vehicles and a composite restaurant car of the earlier stock—166 tons empty

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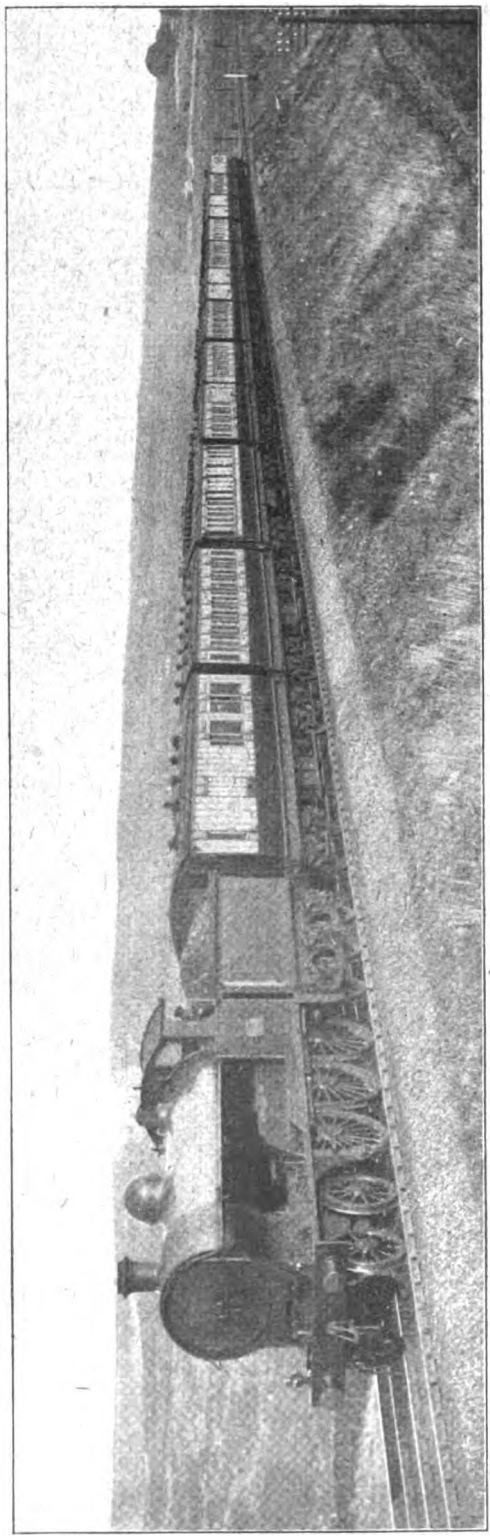

[F. E. Mackay.

LONDON AND NORTH WESTERN RAILWAY.
West Coast express climbing Shap.
4-6-0 superheater locomotive, No. 1691, *Pathfinder*, "Prince of Wales" class.

[Photo

and 175 tons loaded—while the engine was a 3-cylinder compound "Atlantic," No. 258, *The Right Hon. Viscount Cross, K.C.B., G.C.S.I.*, to quote the whole of the generous appellation that appears on the name-plate. A very good start was made, as we were through Harrow, 9·2 miles, in 13 min. 40 sec., speed only falling to 44 m.p.h. on the concluding 1½ miles at 1 in 94–105; Northwood, 13·7 miles, in 18½ min.; and Rickmansworth, where speed was reduced, 17·2 miles, in 22 min. Up the 7-mile ascent to beyond Amersham, mostly at 1 in 105, we went at a steady 36 m.p.h., covering the 6·2 miles between Rickmansworth and Amersham, in 10 min. 10 sec. But the going from that point down to Aylesbury was of the easiest, the highest rate before Missenden being 71½ m.p.h., the lowest on the little "summit" beyond 52, while the tempting stretch past Wendover was taken at but little over 70 m.p.h. and with frequent applications of the brake. We ran through Aylesbury in 46 min. exactly (38 miles), and over Quainton Road Junction, with a pronounced slack, in 52 min. 10 sec. (44·4 miles). Another slack was made at Grendon Underwood Junction, 46·8 miles from town, which was passed in 54 min. 40 sec.

Now on Great Central metals proper, we ran excellently, as always, although we were well within schedule time. None of the 1 in 176 ascents reduced the speed much below the mile-a-minute rate, the minimum at Finmere being 53½, and before Helmdon 59, after 3 and 4 miles at this inclination respectively. The top speed on the short descent beyond Finmere was 68 m.p.h., and on the drop to Culworth Junction 72½ m.p.h. So, after passing Calvert, 48·8 miles, in 56 min. 55 sec., we covered the 10·5 miles thence to Brackley (almost all uphill) in 10¾ min., and the 9·8 miles from Brackley to Woodford in 9¼ min. Total time from Marylebone was now 76

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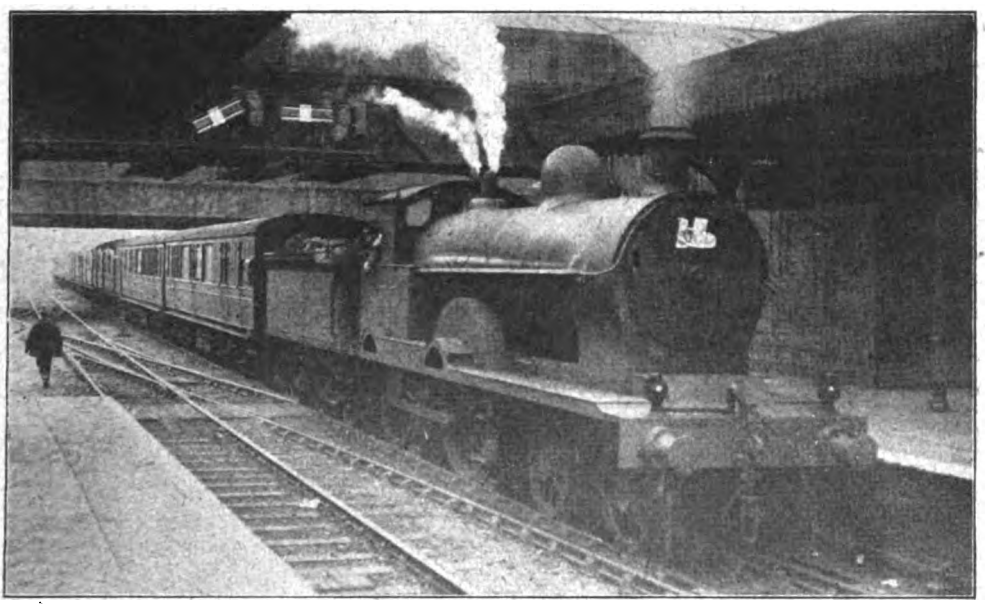
min. 55 sec., and distance 69·1 miles. We did nothing astonishing beyond Woodford: indeed, brakes were applied at first on the 1 in 176 descent from Catesby Tunnel, although we did finally touch 75 m.p.h., while we took things easily after that, falling to 56 m.p.h. at Rugby "hump," and only touching 67 at Shawell. The minimum rate on the 1 in 176 ascent to Lutterworth was 56 m.p.h., and, running moderately down Ashby bank, with a maximum rate of 77½ m.p.h., we reached Leicester in 108 min. 20 sec., which was 40 sec. under the allowance for this 103·1 miles' run. And that time included a slight permanent way check for and 180 tons with passengers and luggage. There was a very violent west wind to contend with on this journey. The start was precisely similar to those of the previous trip, the times being: to Harrow 13½ min.; to Northwood 18 min. 25 sec.; to Rickmansworth 21 min. 55 sec.; and to Amersham 31¾ min., the speed both through Rickmansworth and up the bank being higher than before. On the 1 in 105 it was maintained steadily at 40 m.p.h. for some distance, falling very gradually to 38½ near the summit. Then followed another most leisurely descent to Aylesbury, with a speed of 70 m.p.h. before Missenden and 52 after,



Photo] [*J. Macartney Robbins.*

LONDON AND NORTH WESTERN RAILWAY.

4-4-0 locomotive, No. 622, *Euphrates*, hauling empty Great Central Railway ambulance train at Willesden Junction.

the new junction at Whetstone, so that the engine had matters well in hand all the way. The time from Woodford to Rugby, 14·1 miles, was 12 min. 50 sec.; from Rugby to Lutterworth, 6·8 miles, 6 min. 40 sec.; and from Lutterworth into Leicester, 13·1 miles, 11 min. 55 sec. Net time over this stage of the journey may be taken as 107¾ min.

It may be well to follow on at once with the second journey as far as Leicester, in order to compare the running on the two occasions stage by stage. No. 2 trip was made behind one of the simple "Atlantics" —No. 1092—with a slightly heavier load of five 60-ft. cars, weighing 173 tons empty, and a maximum of only 68 m.p.h. at Wendover. Very pronounced slacks were made at Aylesbury and Quainton Road Junction, the times to the former being 46 min.; to the latter 52¾ min.; to Grendon 55½ min.; and to Calvert 57½ min. The two severe slacks had now brought the time of this journey behind that of the last, but fine work beyond Calvert soon recovered the arrears. With minima of 56 m.p.h. at Finmere and beyond Brackley, and maxima of 67 beyond Calvert and Finmere and 74 at Culworth Junction, the Calvert–Brackley length took only 10 min. 5 sec., and the Brackley–Woodford stretch 9 min. 20 sec.—

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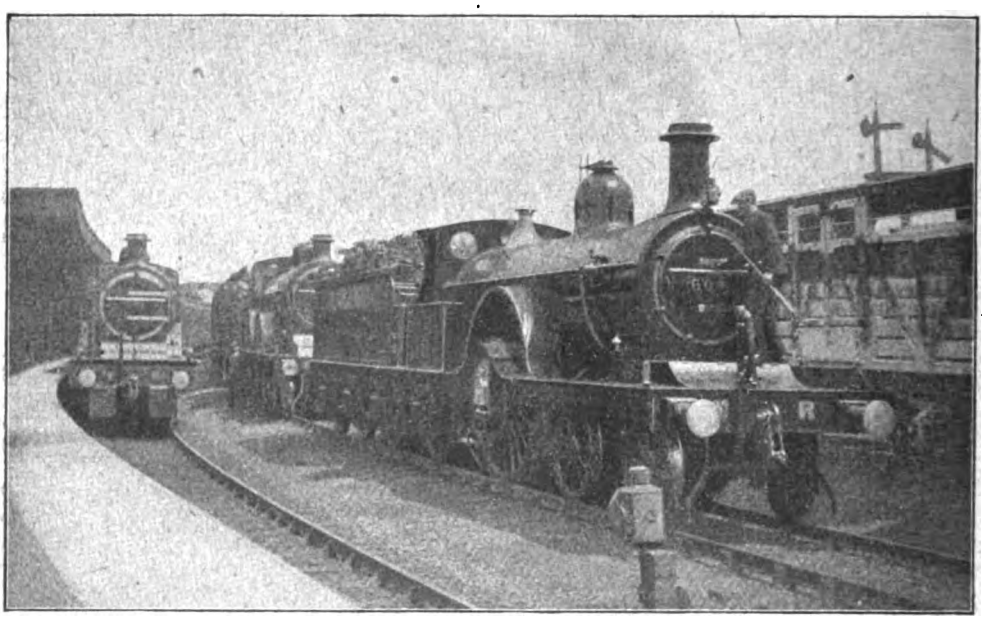
total, 76 min. 55 sec. from town, tieing with the previous journey. Down to Braunston we only touched 74 m.p.h., but we passed Rugby at 58½, reached 72½ again at Shawell, went up to Lutterworth at a minimum rate of 55, and after touching 72½ m.p.h. on Ashby bank, shut off steam. This resulted in times of 12 min. 40 sec., Woodford–Rugby; 6 min. 35 sec., Rugby–Lutterworth; and 12 min. 25 sec., Lutterworth–Leicester. Total time on this occasion from London to Leicester was 108 min. 35 sec.—again inside schedule after the easiest of running. The 49·6 miles from Calvert to Whetstone, sharply undulating throughout, were covered on the first occasion in 46¾ min. and on the second in 46¼ min.

Next we have the stretch of 23·4 miles from Leicester to Nottingham, for which the sharp allowance of 24 min. was until recently in force. Both drivers fractionally exceeded this time—by 10 sec. in each case—although the approach to Victoria station was very cautious, and No. 1092 suffered signal delays in addition. No. 258 passed Loughborough, 9·8 miles, in 11 min. 25 sec., at 77½ m.p.h.; went up the 2 miles at 1 in 176 to Barnston with no lower rate than 57 m.p.h.; and then sustained 75 m.p.h. past Ruddington, passing East Leake, 14·4 miles, in 15 min. 40 sec.; Ruddington, 19 miles, in 19½ min.; and Arkwright Street, 22·5 miles, in 22½ min.—*i.e.*, in "even time." But No. 1092 was much more brisk, as, although the time to Loughborough was the same, we passed that town at 80 m.p.h., breasted Barnston Summit without the speed falling below 61½ m.p.h., and then sustained 79 until well beyond Ruddington. So on this occasion we passed East Leake in 15 min. 25 sec.; Ruddington in 19 min. 5 sec.; and Arkwright Street in 22 min., and should have reached Victoria comfortably in 23½ min., or in "even" time start-to-stop, but for the signal check outside.



Photo] [*C. B. Harley.*

MIDLAND RAILWAY.

Engines Nos. 604, 538 and 771 at Gloucester.

The subsequent allowance of 47 min. from Nottingham to Sheffield was the fastest in force over this section, and, in consideration of the heavy grades and the cautions in force for colliery subsidences, was quite a good one. But No. 258 found no difficulty in keeping it, attaining a speed of 54 m.p.h. on the slight descent past Bulwell, and keeping at a steady 43½ on the long 1 in 130 rise past Annesley, although at the north end of Kirkby Tunnel the rate had fallen to 41 m.p.h. So Hucknall Town, 5·8 miles, was passed in 9¾ min.; Kirkby South Junction (at the summit of the ascent), 10·8 miles, in 16 min. 35 sec.; Pilsley, 17·9 miles, in 24

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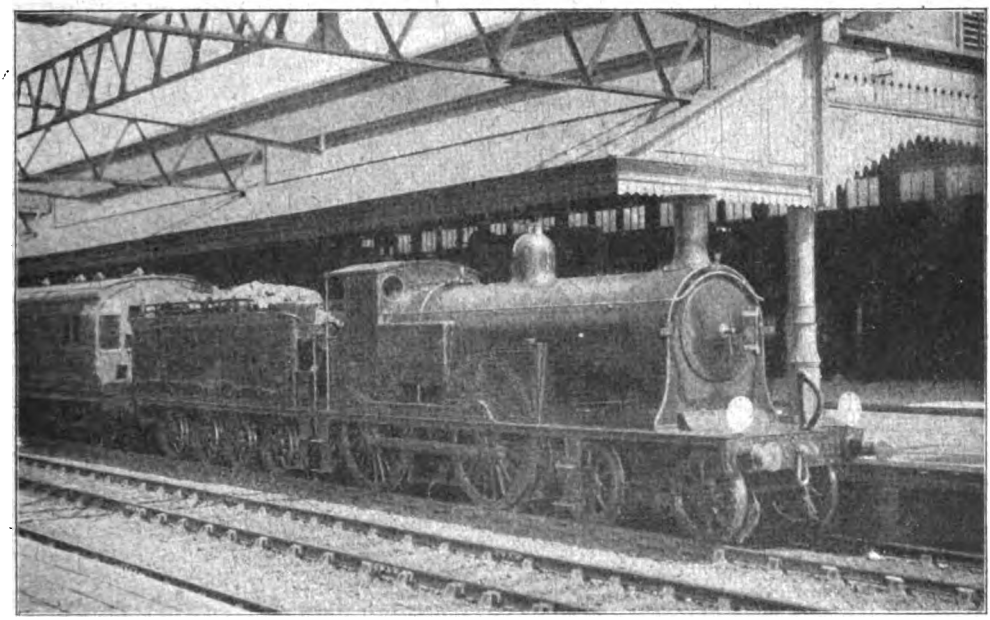
min. 25 sec.; and Heath, 20·3 miles, in 27 min. 5 sec. After slacking to 45 m.p.h. through Heath, we touched 70 m.p.h. at Duckmanton, "eased" to 60 at Staveley, reached 64 at Eckington, and "eased" again to 53 at Woodhouse, while the minimum at Darnall summit was exactly 45 m.p.h. So Staveley, 26·2 miles, was passed in 33 min. 10 sec.; Woodhouse, 32·8 miles, in 40 min. 25 sec.; and Sheffield, 38·2 miles, was reached in 46 min. 35 sec.—again within schedule time. But No. 1092 was not so fortunate, as, after a good start to Hucknall in 9 min. 35 sec., a whole string of signal checks ensued to Kirkby, and with more the Penistone slip portion to 200 tons. On the 4¼ miles up at 1 in 132 to Oughty Bridge speed rose to 42½ m.p.h.; on the succeeding 5 miles at 1 in 120 past Wortley we reached 44 m.p.h., while the 3 miles at 1 in 131–160 before Penistone were productive of a "maximum" of 47½ m.p.h. Continuing up the 6½ miles at 1 in 130–124–135 to Dunford Bridge speed fell again by degrees to 41 m.p.h., while in the tunnel itself we suffered a permanent way check. On the other side we touched 70 m.p.h. beyond Crowden, but slacked very carefully for Dinting Viaduct and Godley Junction; the journey to Guide Bridge, however, was completed in exactly



Photo] *[Frank Roberts.*

LONDON AND SOUTH WESTERN RAILWAY.
4-4-0 locomotive, No. 712, at North Road station, Plymouth.

moderate running than previously from Pilsley onwards the total time to Sheffield was 50 min. 50 sec.—a loss of nearly 4 min.

There now came the final mountainous stretch from Sheffield to Manchester, the allowance of 48 min. for the 35·3 miles as far as Guide Bridge being by no means easy, while smart running is needed to cover the 11·1 miles from Guide Bridge into the Central station in 16 min., inclusive of slacks at Fairfield and Chorlton, and a cautious approach to the terminus. But compound No. 258 again made light of these difficulties, although for the steepest part of the climb the load was increased by the addition of the 48 min. allowed. Intermediate times were: to Oughty Bridge, 4·8 miles, 8 min. 55 sec.; to Wortley, 8·8 miles, 14½ min.; to Penistone, 12·9 miles, 19 min. 55 sec.; to Dunford Bridge, 18·9 miles, 28 min. 25 sec.; to Woodhead, 22·1 miles, 32 min. 50 sec.; to Hadfield, 28·6 miles, 38¾ min.; and to Godley, 33 miles, 44 min. 5 sec. Net times from Woodhead onwards were about a minute less than the times given, the net time from Sheffield to Guide Bridge being 47 min. A smart run down into Manchester, in exactly the 16 min. allotted, with a maximum rate of 64 m.p.h. at Fallowfield, completed the journey, the engine having

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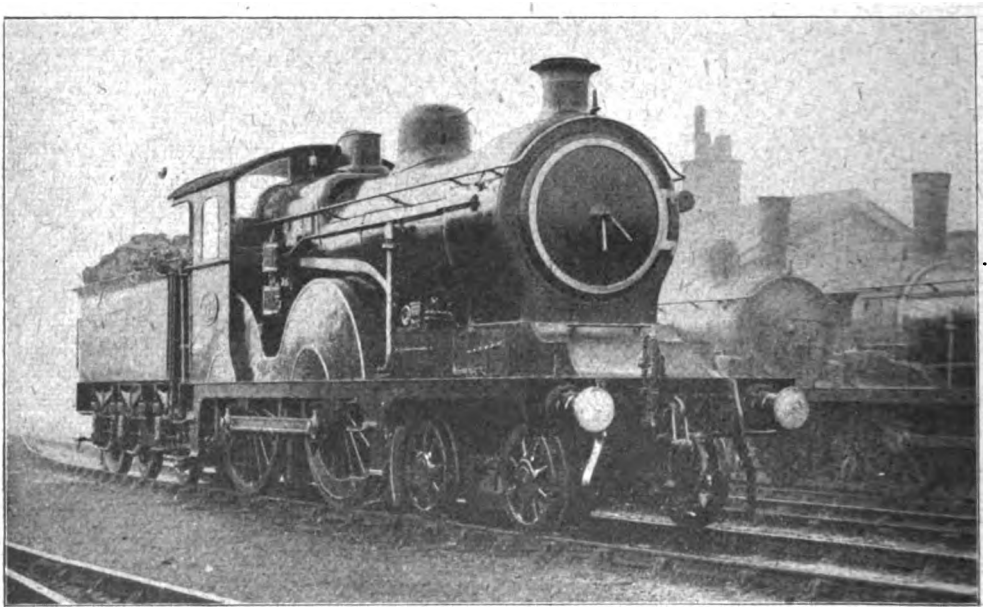
economised 2½ min. in all on the running times throughout.

No. 1092, however, was seriously hampered by the wind beyond Sheffield, blowing on the exposed lengths of line with almost hurricane force, and did not do so well. Further, the load from Sheffield was five large 8-wheelers, and two clerestory vehicles on the Penistone "slip," totalling fully 235 tons with passengers. So at Oughty Bridge we were only doing 36 m.p.h., and at Penistone 39½, although there was a fine recovery after slipping the Bradford portion to 43 m.p.h. at Dunford Bridge. But it took us 9¾ min. to pass Oughty Bridge, 16¼ min. to Wortley, 22¾ min. to Penistone, and 31 min. 25 sec. to Dunford Bridge—exactly 3 min. more than previously. The descent to Guide Bridge also was decidedly leisurely, and with the additional hindrance of adverse signals at Hyde Junction we took 52 min. from Sheffield to Guide Bridge, or 51¼ min. net—a loss of 3¼ min. on schedule. The concluding length into Manchester was run rapidly in 15 min. 25 sec., start-to-stop, but we arrived at 7.37 p.m., 8 min. behind time.

In the opposite direction I wish to describe three runs on the 3.25 p.m. from Sheffield to Marylebone—a sharply-timed express that even the war-time decelerations have only affected to the tune of 4 min. On the first occasion we had out of Sheffield a load of five large 8-wheelers, or 185 tons including passengers and luggage, behind compound superheater "Atlantic" No. 365. We were over Darnall "hump" and through Woodhouse, 5 miles, in 8 min. 20 sec., a slight slack being made for the junction. Staveley Town, 12 miles, was passed in 16 min. 35 sec., and the climbing of the long ascent thence to Pilsley was very fine, the 8·3 miles taking only 10¾ min., although the grade is largely at 1 in 100, while the sustained rate on that inclination was 44 m.p.h. Heath, 17·9 miles, was passed in 24 min. 10 sec., at 45½ m.p.h., and Kirkby, 26·5 miles, in 34 min. 20 sec. Slacking severely over the new junction with the Mansfield line, we ran the remaining 11·7 miles into Nottingham easily in 14¼ min., completing the journey from Sheffield in 48 min. 35 sec.—just inside the 49 min. schedule time—or 47 min. net.

On the second run, No. 361, simple "Atlantic," had a smaller load of four vehicles only—one a first-class kitchen car of the old type—and did some smart work with this 140-ton load. Woodhouse was passed in 7 min. 50 sec.; Staveley in 15 min. 55 sec.; and Pilsley in 28 min. 10 sec.,



Photo] [*J. Macartney Robbins.*

GREAT EASTERN RAILWAY.

4-4-0 rebuilt superheater locomotive, No. 775, at Cambridge.

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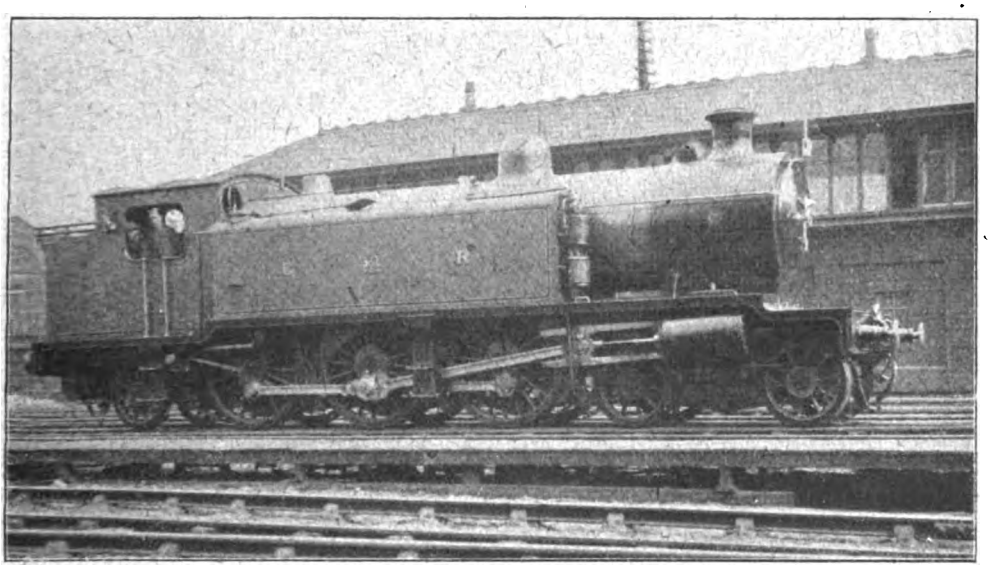
inclusive of a signal check south of Heath. Being occupied with "the grosser pleasures of the dining-car" (as a reader once commented on that truly admirable institution), I regret that I neither recorded the passing time at the last-mentioned station, nor the speed up the bank. Kirkby was passed in 34¾ min., and, running in easily as before, we reached Nottingham in 47½ min., or 46 min. net. The third journey was made behind No. 195—one of the two experimental 4–6–0 engines with 6 ft. 9 in. wheels built to run trials against the "Atlantics"—and the load was four 60 ft. 8-wheelers, or 145 tons. The starting times to Woodhouse and Staveley were exactly the same as those of the second trip, despite a decided slack at Woodhouse Junction, but the maintained speed on the 1 in 100 ascent was only 41 m.p.h., so that it took us 24½ min. to get through Heath, and 27 min. 55 sec. to Pilsley. Kirkby was passed in 34 min. 50 sec., but we were brought to a dead stand by signal at New Basford, 36·6 miles from Sheffield, in 45½ min. from the start. Eventually we reached Nottingham in 52 min. 5 sec. from Sheffield, or 48 min. net. On the first stage, therefore, No. 365—the compound—with the five-coach train, decidedly carries off the honours. The present booking from Sheffield to Nottingham is 50 min.

At Nottingham some fish-vans, which have come through from Grimsby by a special afternoon express, are attached to this train for conveyance to London. They are generally large bogie vehicles of 24½ tons tare weight, and are reckoned at 30 tons each when carrying a full load, so that the addition of a couple of them entails a substantial increase in the train-load. On the first run, however, only one of the added vehicles was an 8-wheeler, the other being a 4-wheeled van, so that No. 365's load was made up to 225 tons. Ruddington, 4·4 miles from Nottingham, was passed in 6 min. 40 sec., but unfortunately we got signals on badly at East Leake, after attaining 64 m.p.h. at the foot of the rise, and so took 17¼ min. to Loughborough, 13·6 miles, and 21 min. 40 sec. to Leicester, 23·4 miles. Net time would be about 25¾ min., or just inside schedule, which has been left unaltered in the new time-tables. No. 361 received the usual "increment" at Nottingham, increasing the load to 200 tons. Ruddington was passed in 6½ min., at 61½ m.p.h.; East Leake, 9 miles, in 11¼ min. (the speed at Barnston, the top of the rise, was 53 m.p.h.); Loughborough in 15 min. 40 sec., at 69 m.p.h.; and Leicester was reached in 25 min. 50 sec. No. 195, the six-coupled engine, was the smartest of any on this section, getting through Ruddington with 205 tons in 6 min. 10 sec., and East Leake in 11 min.



Photo] [*Captain R. A. Chrystal.*

CALEDONIAN RAILWAY.

New 4–6–2 superheater tank locomotive, No. 945, at Edinburgh.

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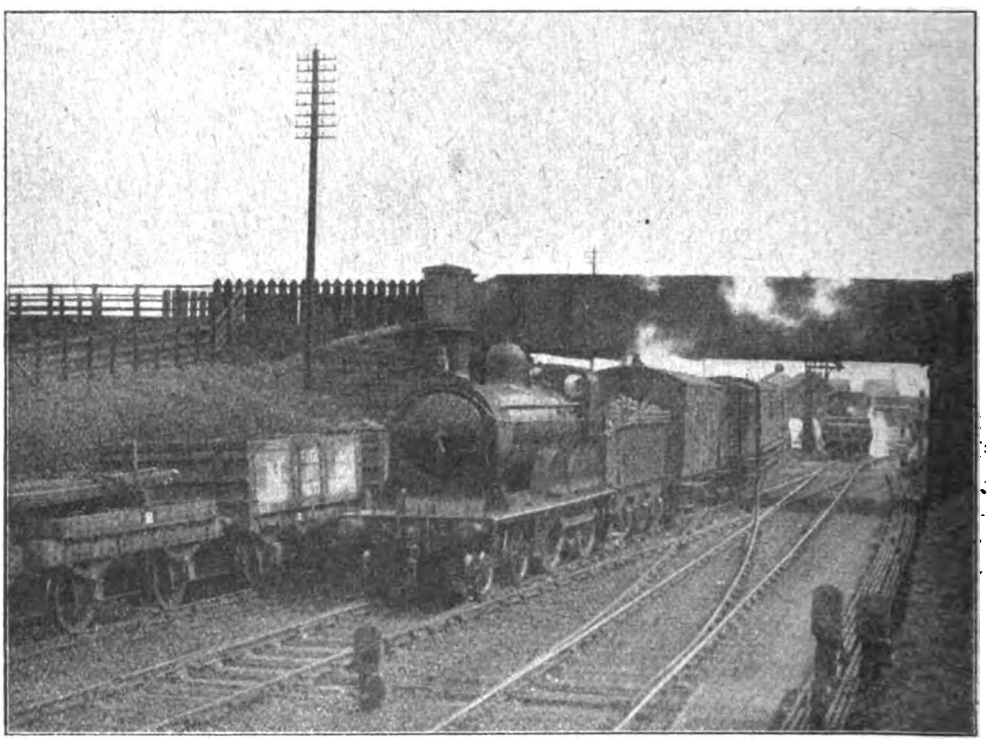
5 sec.; Barnston was passed at 53 m.p.h.; Loughborough in 15 min. 35 sec., at 71½ m.p.h.; and Belgrave, 21·1 miles, in 23½ min. But the stop at Leicester was so slowly made that the actual start-to-stop time was 26 min. 10 sec., although it might easily have been 25½ min.

It is customary to change engines at Leicester on this train, before embarking on the very tight booking of 38 min. for the 34 miles thence to Woodford—a distance that is very largely uphill at 1 in 176. This time has subsequently been increased to 40 min. On the first of these three runs we attached No. 436, *Sir Berkeley Sheffield*—a 4–4–0 superheater engine of the "Director" class—and had a fairly stiff task ahead with 225 tons behind the tender. But splendid work was done, a rate of 54 m.p.h. being reached on the easy ascent before Whetstone, while the sustained rate on the 6⅝ miles at 1 in 176 of Ashby bank was exactly 50 m.p.h. We touched 67 m.p.h. at Lutterworth, fell to 62½ on the short rise beyond, sustained 77½ past Shawell, and, after dropping to 67 on Rugby "hump," were again doing 75 on the level near Braunston before tackling Catesby bank. On the 6½ miles of this ascent speed fell to 45½ m.p.h. before we entered the tunnel, and further to 41½ as we emerged, it being a curious but almost invariable practice of Great Central drivers to do much better work up Ashby bank than up the practically identical rise to Charwelton. But, despite a very slow stop, we completed the 34 miles in 38¼ min., the passing times being: to Ashby, 9·2 miles, 12¼ min.; to Lutterworth, 13·1 miles, 16 min. 35 sec.; to Rugby, 19·9 miles, 22 min. 25 sec.; to Braunston, 24·6 miles, 26 min. 20 sec.; and to Charwelton, 31·6 miles, 34⅞ min. We could easily have reached Woodford in under 38 min., had we stopped more briskly.

On the second run we retained the services of "Atlantic" No. 361 from Leicester, with 200 tons, and lost 1 min. 10 sec. to Woodford. Speed did not rise above 53 m.p.h. before



Photo] [*Frank Bell.*

NORTH BRITISH RAILWAY.
10.35 a.m. train, Edinburgh to Glasgow (Hyndland), leaving Westcraigs.
4–4–0 locomotive, No. 478.

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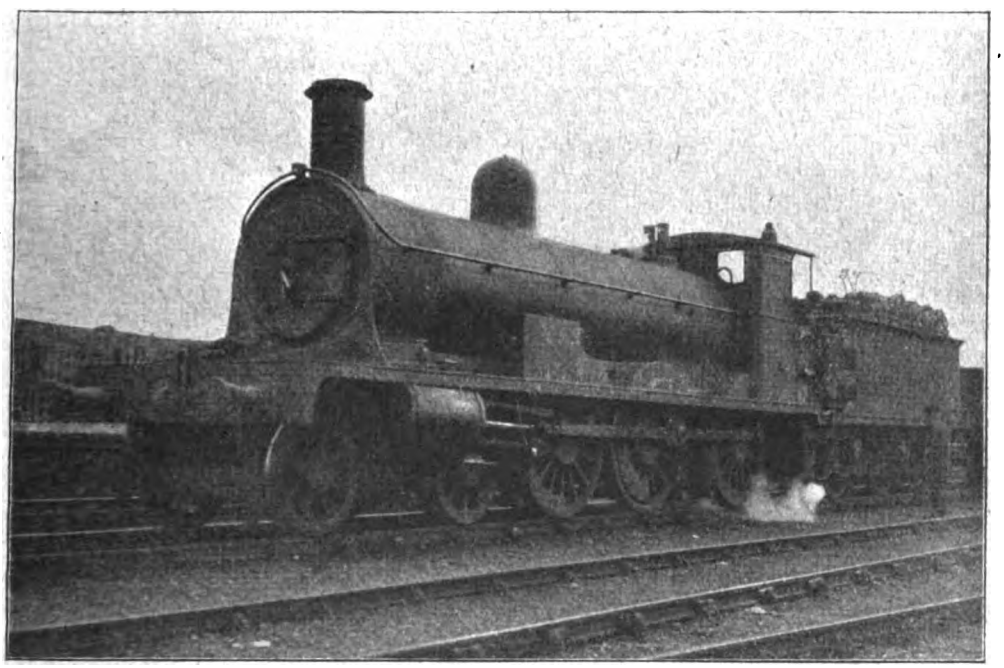
Whetstone and fell to 45 at Ashby; at Shawell and Braunston the maxima were 75 and 70 m.p.h. respectively, while the minimum at Rugby was 66: but up Catesby bank we did rather better than before, entering the tunnel at 48, and leaving it at 43½ m.p.h. We passed Ashby in 12 min. 35 sec.; Lutterworth in 17¼ min.; Rugby in 23 min. 20 sec.; Braunston in 27 min. 35 sec.; and Charwelton in 35 min. 50 sec. No. 363—a simple "Atlantic"—which came on at Leicester on the third run, with the 205-ton train-load, made the best time to Woodford in virtue of faster running up Catesby bank than on the previous trips. Speed rose to 53½ m.p.h. at Whetstone and fell to 48½ at Ashby; we did 77½ m.p.h. before Rugby and 75 beyond with an intervening minimum of 67; and then on the final ascent we entered the tunnel at 52½ and left it at 48½ m.p.h. So Ashby was passed in 12 min. 35 sec.; Lutterworth in 17 min.; Rugby in 22 min. 55 sec.; Braunston in 26 min. 50 sec.; Charwelton in 34 min. 10 sec.; and Woodford was reached in 37 min. 20 sec.—a very smart piece of work. The next stretch—to Brackley—is a very short one of only 9·8 miles, with sharp undulations, for which 13 min. was allowed to re-starting, as against the present increased time of 14 min. No. 436 compassed the distance in 12 min. 10 sec., start-to-stop; No. 361 in 12½ min.; and No. 363 very smartly in 11 min. 55 sec.

There now remained the last "sprint" from Brackley into town of 59·3 miles, allowed 67 min.; this was temporarily curtailed to 66 min. in the January alterations, but is now again 67 min. as before. The start to Grendon Junction is a very favourable one, and No. 436, although not exceeding 67 m.p.h., and shutting off steam beyond Calvert, passed the junction, 12·5 miles, in 12 min. 50 sec., and Quainton Road Junction, 14·9 miles, in 15 min. 25 sec., slackening speed at both points. Before Aylesbury we touched 67 m.p.h., and then went up the 6½ miles of Wendover bank, mostly at 1 in 117, with no lower speed than 42½ m.p.h.; the highest rate on the short descent to Missenden was 72½ m.p.h., and we topped the 1 in 160 to Amersham at 55. But the driver did not exceed 72½ m.p.h. in



Photo] [*A. E. Glen.*

HIGHLAND RAILWAY.

4–6–0 goods engine, No. 115, in Newtonmore station.
First 4-6-0 type in Great Britain. Designed by the late Mr. David Jones.

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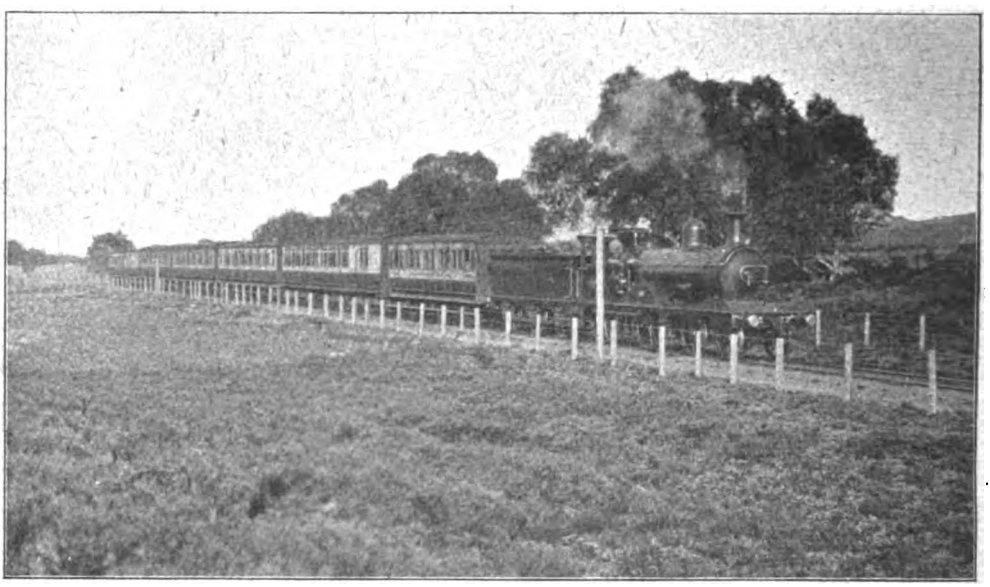
descending Chorley Wood bank and simply crawled through Rickmansworth, the time to the last-mentioned point, 42·1 miles, being 43 min. 50 sec.; to Amersham, 35·7 miles, 37 min. 25 sec.; and to Aylesbury, 21·3 miles, 21 min. 40 sec. Up the 1 in 176 to Northwood we attained 46½ m.p.h., and then touched 68 at Pinner, passing Harrow, 50·1 miles, at reduced speed in 53¼ min. from the start. Then followed an exciting dash for the "post," as we touched 70 m.p.h. at Kenton, and compassed the 9·2 miles into Marylebone in what was up till then my record time of 10¾ min., this length of line requiring cautious running at several different points. So we completed the journey from Brackley in 64 min. exactly—3 min. under schedule time.

Neither of the other engines did quite so well. No. 361 touched 75 m.p.h. beyond Finmere, but was then slowed for permanent way repairs, and so took 14 min. 20 sec. to Grendon (slacking there with excessive severity), 17½ min. to Quainton Road Junction, and 23 min. 50 sec. to Aylesbury. Commencing Wendover bank at 64½ m.p.h., we fell to 37½ on the ascent, but touched 74 at Missenden and passed Amersham at 55½; down to Rickmansworth we ran at 76½ m.p.h. So Amersham was passed in 40 min. 25 sec.; Rickmansworth in 46¼ min.; Harrow in 55 min. 35 sec.; and Marylebone was reached in 66 min. 35 sec., or 65½ min. net. No. 363 also touched 75 before Calvert, passing Grendon in 13 min. 20 sec.; Quainton Road Junction in 16 min.; and Aylesbury in 22½ min.; the maxima here and at Missenden were 64 and 72½ m.p.h. respectively, and the minima at Wendover and Amersham 41 and 51, the last-mentioned being rather poor, as was also the moderate speed of 72½ m.p.h. down Chorley Wood bank. So we took 39 min. to pass Amersham, 45 min. 5 sec. to Rickmansworth, 54¼ min. to Harrow, and then, with a second 10¾ min. "finish" into Marylebone, 65 min. to the terminus, thus gaining 2 min. and arriving dead on time.



GREAT NORTH OF SCOTLAND RAILWAY.
Down Deeside express.
4-4-0 locomotive, No. 27.

These are a few examples, recorded quite casually, of what the Great Central can and does "do" in the way of ordinary performance. Despite the somewhat unusual circumstance of the trains being almost exclusively "Atlantic"-hauled, it will be noticed that out of 25 tightly-timed point-to-point runs, time could only be booked against the engine in two cases, one to the extent of 70 sec., and the other, under very adverse conditions, of 3¼ min. Such a record is most commendable.

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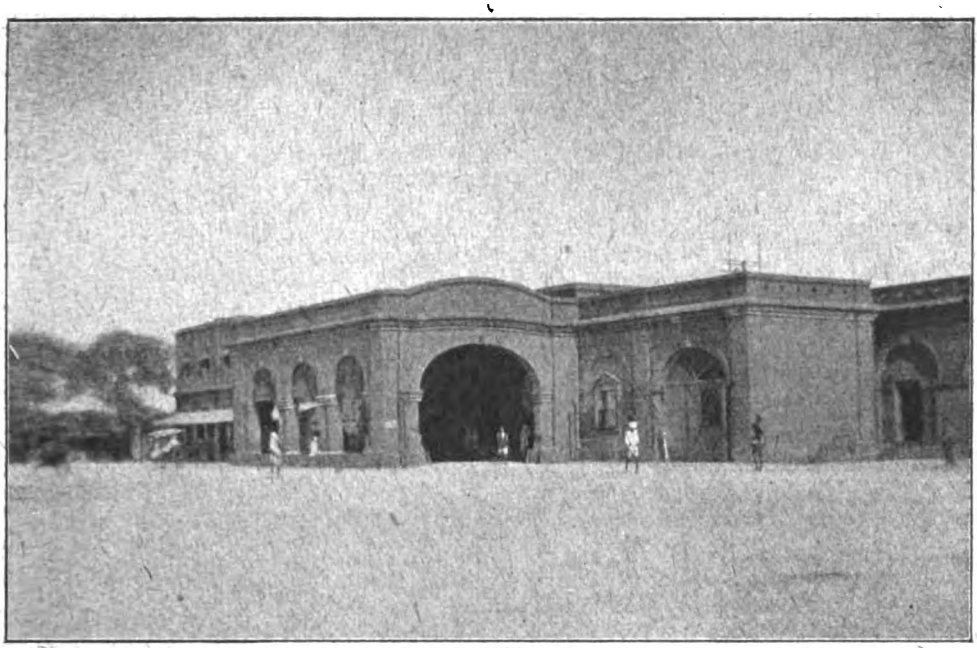

LUCKNOW JUNCTION.
Exterior view.

A Notable Indian Railway Junction.

LUCKNOW.

Oudh and Rohilkand Railway.

By BRIAN BRAMALL.

RAILWAY stations in the chief cities of India are not, as a rule, greatly distinguished for their architectural beauty. Indeed, when it is remembered that India is a country world-famous for the grace and magnificence of her palaces and temples, it is somewhat disappointing to find how severely utilitarian in character are most of her great railway stations.

One could have hoped that the claims of æstheticism, so handsomely acknowledged in other buildings, would have found corresponding expression in railway station architecture.

That this is not the case is, no doubt, in some measure due to the fact that the great bulk of railway users in India are not Europeans, but natives of the lower classes, who do not look for any great magnificence or luxury in station buildings and appointments.

To those who have travelled in India, some notable exceptions to this general statement will at once suggest themselves. There can be few finer stations in the world than the Victoria terminus of the Great Indian Peninsular Railway at Bombay; while Calcutta (Howrah), Madras and Delhi all possess fine modern stations of generous proportions. But these are the exceptions, and serve but to enhance the mediocre and unpretentious character of the average large Indian railway station.

Lucknow is a case in point. The city, while it has lost something of its old time magnificence and prosperity, and as a commercial centre has largely given place to its near and prosperous neighbour, Cawnpore, is still to be counted amongst the first six cities of India. It is the chief city of the United Provinces, and the seat of its Government; it is a great military station, has an immense native population, and is, moreover,

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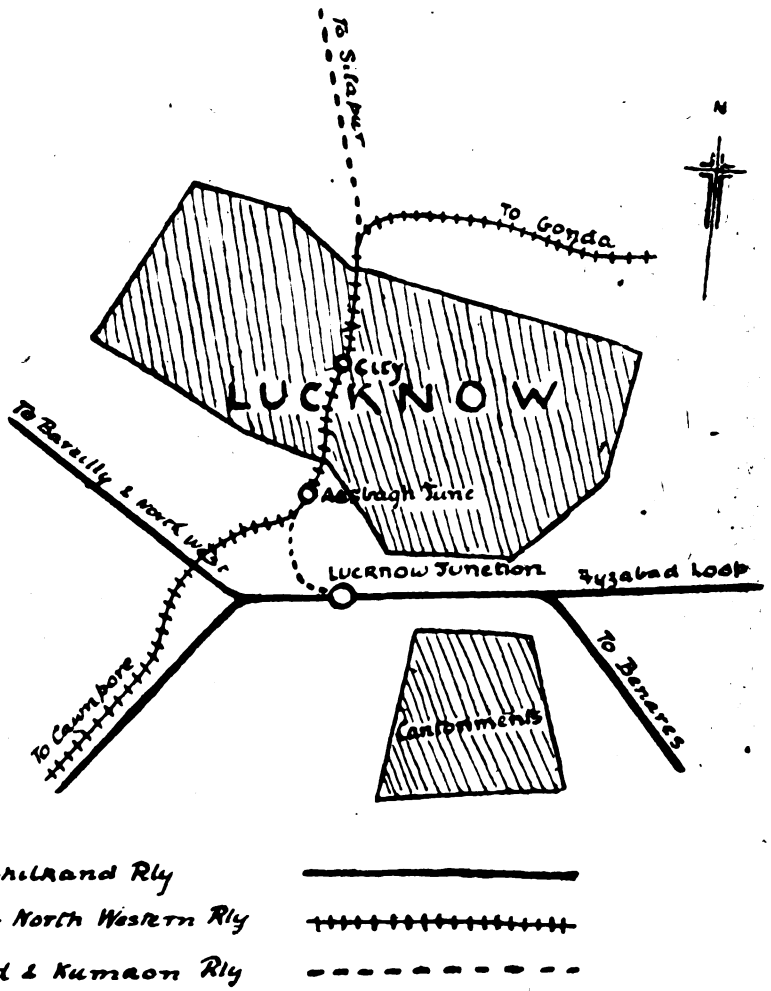
a railway centre of no small importance, although not to be compared in this respect with Delhi, Cawnpore or Lahore. Yet there is little enough in the appearance of its railway station to suggest this fact to the traveller.

Before attempting a brief description of the station itself, it will be convenient here to explain the general position of Lucknow and the various lines which converge on it. Lucknow Junction is on the main line, and is the property of the Oudh and Rohilkand Railway—a line little known in England, and yet a most important one. It forms a link between the East Indian and North Western Railways, thus providing the shortest route between Calcutta and the cities of the lower Ganges Valley, and Rawal Pindi, Lahore, Peshawar, and the cities of the Punjab and North-West Frontier. The Calcutta–Peshawar mails travel *viâ* this route, connection with the East Indian Railway being made at Moghal Sarai, and with the North Western Railway at Saharanpur. Moghal Sarai practically adjoins the city of Benares, being at the opposite end of the bridge which spans the Ganges at this point.



SKETCH MAP OF LINES CONVERGING ON LUCKNOW.

About a mile west of Lucknow station the Oudh and Rohilkand Company's branch from the thriving and rapidly growing city of Cawnpore joins the main line. This is an exceedingly important stretch of line, as connection is made at Cawnpore with the East Indian Railway's main line, the great Indian Peninsular Railway, and the metre gauge lines of the Bombay, Baroda and

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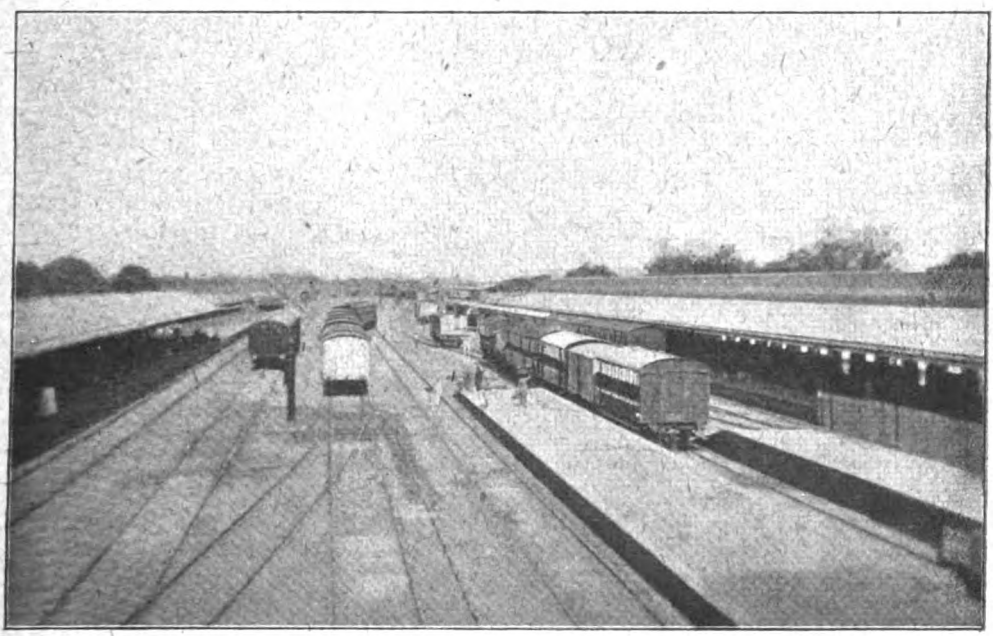
Central Indian Railway. The through Lucknow–Bombay mails, one train in each direction daily, travel *viâ* this route to Cawnpore, and thence to Bombay *viâ* Jhansi and the Great Indian Peninsular Railway. There is also a considerable local passenger and goods traffic between Lucknow and Cawnpore.

The alternative route between Benares and Lucknow, known as the Fyzabad Loop, also joins the Oudh and Rohilkand main line at Lucknow, some two miles east of the station. This loop is largely used by goods trains and passenger trains of secondary importance.

Junction. The latter station and Lucknow city station are used jointly by the two metre gauge railways, and are the only other stations in Lucknow. With these latter two stations, however, we are not concerned in the present article.

The Bengal and North Western line has its terminus at Cawnpore, and for the whole distance between that city and Lucknow the railway runs parallel to, and within sight of, the Oudh and Rohilkand Company's branch. Passing under the Oudh and Rohilkand main line at Lucknow, the line proceeds to Aisbagh and City stations, and then, turning



LUCKNOW JUNCTION.

Looking West.

No. 2 Island Bay Platform on extreme right is shown with Great Indian Peninsula Mail Train alongside.

One other line, the metre gauge Rohilkand and Kumaon Railway, uses the junction station. This company's trains terminate at Lucknow, the line running northwards to Sitapur, and thence north-west to Bareilly, where the Oudh and Rohilkand main line is again joined.

In addition to the above, connection is made at Lucknow with another, and far more important, metre gauge line, the Bengal and North Western Railway, that company's trains having running powers over the Rohilkand and Kumaon Company's spur between Lucknow Junction and Aisbagh eastward, runs to Burwhal and Gonda, and the large district lying north of the Ganges and served by the Bengal and North Western metre gauge lines.

A "shuttle" service is maintained by the Bengal and North Western Railway between Lucknow Junction and Aisbagh stations, connecting with that company's trains to and from Cawnpore.

A glance at the map on page 104 will make the above remarks clearer to the reader.

Turning now to the station itself: The exterior is a low, unimposing, barrack-like structure of red brick, quite devoid of any

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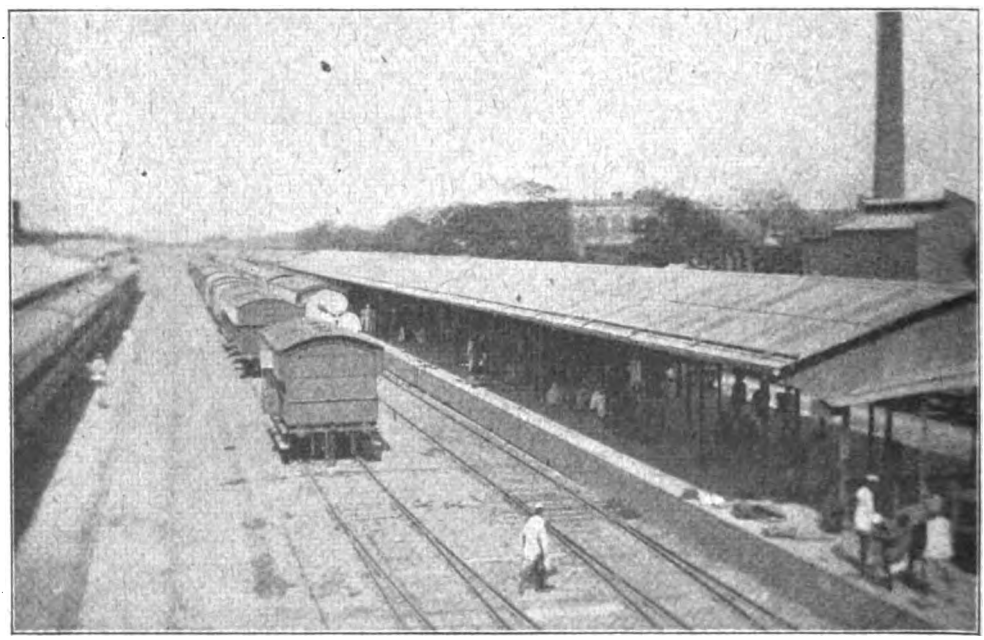
architectural feature of note. Access to the platforms is gained through the booking hall —a gloomy, cheerless chamber, and with its iron railings, more suggestive of a prison than a railway station. This opens direct on to the main (No. 1) platform, on which are placed all the waiting and refreshment rooms, and other public conveniences and offices.

It is a common practice in Indian railway station construction to place all the station buildings on one platform, and to use that platform for all the important passenger trains *in both directions*. It rarely happens that two important long-distance trains have to be dealt with at the same time, so that this is a much simpler matter than would at first appear, and at least has the merit of economy and simplicity. This is the case at Lucknow, the up and down mail and express trains all using No. 1 platform.

It should be explained here that the Indian railway passenger service is divided into three classes of trains: "Mail," "Express," and "Passenger," taking precedence in that order; somewhat after the fashion of the French "Train-de-luxe," "Rapide," and "Omnibus." This has no reference, of course, to trains of a purely local character.

At the western end of No. 1 platform there is a small "dock" and a large island bay, one side of which is chiefly used by the through Bombay mails and the local Cawnpore trains, and the other by the trains of the Rohilkand and Kumaon Railway.

Separated from No. 1 platform by four lines of rails, and connected by a footbridge, is another island platform. This is of great length, and capable of receiving two trains end on end, on either face. Indeed, the railway company regard it as two distinct platforms, numbering the eastern and western ends thereof 3 and 4 respectively.



LUCKNOW JUNCTION.
Looking East.
No. 4 platform on right. Peshawar-Moghall Sarai Mail Train alongside No. 1 platform on left.

These numbers apply to both sides of the platform. These last two platforms are entirely innocent of station buildings or public comforts of any kind, and are used by "passenger" trains and semi-local trains from the Fyzabad Loop and an occasional local train from Cawnpore.

All the platforms are provided with hideous corrugated iron roofs, which give the station anything but a pleasing appearance. It is probable that a glass awning roof would be impracticable owing to the intense heat experienced during eight months of the year.

Traffic is controlled by four signal boxes, all manually worked. The locomotive

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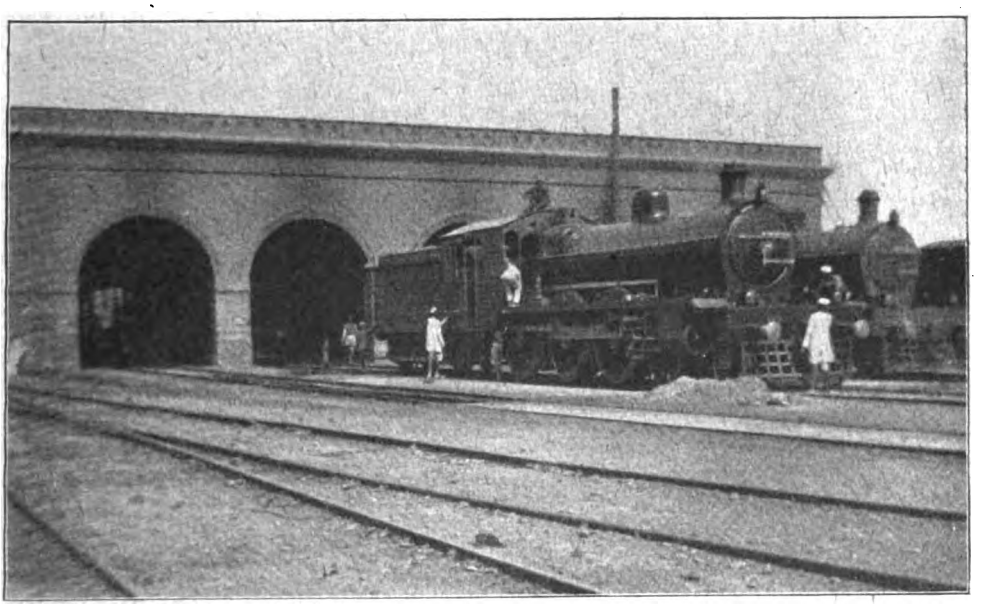
running sheds are on the south side of the line, three-quarters of a mile west of the station, and opposite them there are extensive goods sidings. A mile beyond the engine sheds the main line passes between the carriage and wagon shops of Oudh and Rohilkand Railway and the Rohilkand and Kumaon locomotive works.

With this brief description of the Junction station, we may now conveniently discuss the traffic dealt with in an average day's work.

Chief interest undoubtedly centres around the arrival and departure of the mail trains, to which the times of the branch trains



LUCKNOW ENGINE SHED.
Oudh and Rohilkand Railway.

largely conform. Indeed, between these times the station presents a rather lifeless appearance, very little other than goods traffic being carried on.

The first train to arrive is the down Peshawar–Moghal Sarai (for Calcutta) mail, due at Lucknow at 9.27 a.m., and timed to leave at 9.40 a.m. Moghal Sarai is reached at 3.20 p.m., and Calcutta at 6 o'clock next morning. There is a through East Indian Railway and Oudh and Rohilkand joint-stock carriage from Dehra-Dun to Calcutta on the train, as on the up mail, which is attached at Lhaksar Junction. Dehra-Dun is at the foot of the Himalayas, and is the station for the popular hill resort of Mussoorie and the military hill stations of Landour and Chakrata.

The through Bombay mail, composed of Great Indian Peninsular locomotive and stock, is due to leave at 9.42 a.m., but awaits the arrival of the Moghal Sarai mail, should that train be late.

There is no other mail till the arrival of the up Peshawar–Moghal Sarai mail at 3.37 p.m. An extra through carriage to Dehra-Dun for the Cawnpore and Lucknow traffic is attached here. The train has a 23-min. wait at Lucknow and leaves for Bareilly and the north-west at 4.0 p.m.

As a matter of interest, it may be remarked that the train by which the Dehra-Dun through carriages are conveyed from Dehra-Dun to Lhaksar Junction is of a most cosmopolitan character, being composed as follows :—(A) Through North Western Railway coach for Lahore, (B) through Great Indian Peninsular coach for Bombay, (C) through Oudh and Rohilkand coach for Lucknow and Cawnpore, and (D) through East Indian and Oudh and Rohilkand joint stock coach for Calcutta.

The last mail of the day is the through mail from Bombay due at Lucknow at 7.50 p.m. A dining car is provided on this train. It is, however, detached at Cawnpore should all the passengers requiring dinner have been

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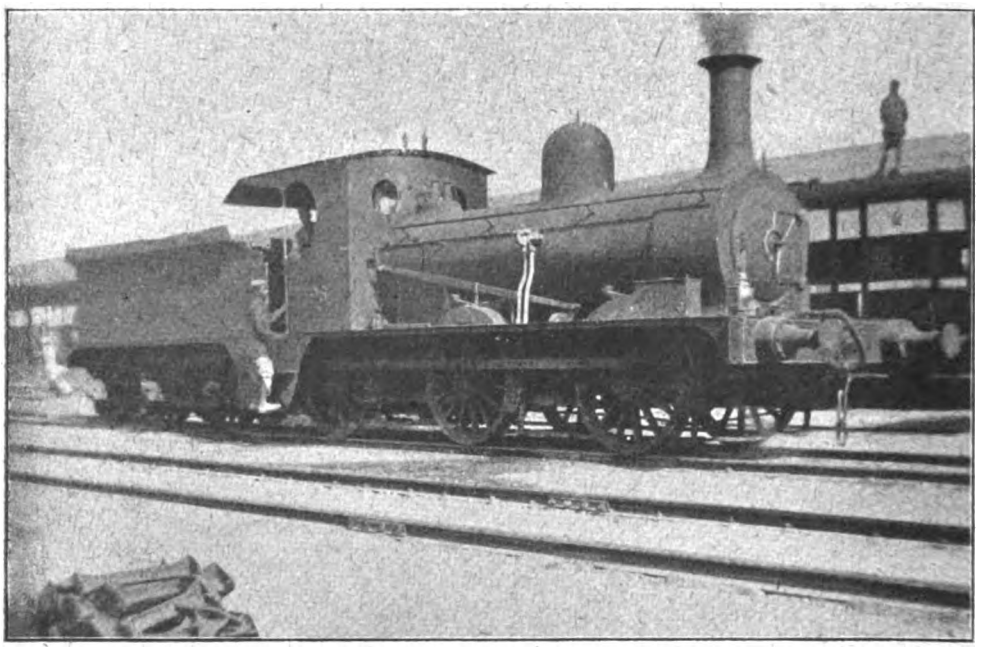
served before that city is reached, otherwise it is run on to Lucknow. This concludes the Lucknow mail service, with the exception of the special trains which bring the weekly English mails from Bombay.

A word or two with regard to the mail trains themselves may not be out of place here. They are fairly liberally timed, and are usually very punctual in their running, though heavy floods in the rainy season are sometimes a fruitful cause of delay. Invariably heavy trains (ten or eleven weighty eight-wheeled coaches being no unusual figure) they are hauled by powerful two-

day time the upper berths can either be used for light luggage or else fastened back against the back of the carriage. No bedding is provided by the railway company, passengers always bringing their own when travelling. Each compartment is provided with its own lavatory accommodation, including a bath which, however, is generally rather dirty and by no means inviting. There is no hot water laid on.

The trains are non-corridor. Indeed, there are very few corridor trains to be found in India, two notable examples being the Eastern Bengal Railway's Darjeeling mail,



OLD 0-6-0 GOODS LOCOMOTIVE AT LUCKNOW JUNCTION.
(Engine built by Dübs & Co.)

cylinder 4–6–0 engines, built by the North British Locomotive Co. These are fine locomotives, and if it were not for the Walschaert valve-gear and straight pattern boiler, would not be unlike the Great Western Railway's six-coupleds, though lacking the pleasing finish of the latter company's engines.

Very few journeys are undertaken in India without at least one night being spent in the train, and all first and second class carriages are therefore constructed with that end in view. Each compartment holds four persons, and has two berths arranged on each side of the carriage, one above the other. In the

and the fast trains on the Bombay–Poona service of the Great Indian Peninsular. The running of the trains is fairly smooth and steady, though not quite up to the British standards at home in this respect. The wheels are of the open, spoked variety, and give forth a hollow, metallic sound when passing over the rail-joints. The trains are electrically lighted throughout, and are, of course, provided with fans. The exteriors are not unpleasing when new. The Oudh and Rohilkand coaches have coffee-coloured bodies and upper panels of cream ; a scheme of colouring which is adopted, with slight variation by the North Western and Great

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Indian Peninsular Railways. Dining cars are provided on all mail services. (The East Indian Railway, presumably as a war economy, ceased to run dining cars from the beginning of June, 1916.)

As has already been mentioned, the average speed of the mail trains is not high, but there is not the demand for speed in India that there is at home. The trains, as a rule, have to cover vast distances, and passengers expect to spend a considerable time in the train. Moreover, time is not of such great consequence in the East, and passengers are chiefly concerned with obtaining a comfortable journey, with a good night's rest, and are content so long as they do not arrive at their destination at inconvenient hours of the night. In many cases, trains are intentionally timed liberally, so as not to arrive at a city too early in the morning. The average speed of the mail trains throughout the country, inclusive of stops, works out at 30–35 miles an hour. But it must be remembered that half-an-hour stops at important junctions for transhipment of mails, watering of engines, etc., etc., are of frequent occurrence.

The express and passenger services naturally fall under three heads, viz. :—(1) Lucknow to Benares (main line), (2) Lucknow to Benares (Fyrabad Loop), and (3) Lucknow to Bareilly, Saharanpur and the North-West. The majority of trains terminate at Lucknow, there being only two through trains in each direction daily. It will be simplest to deal with these services in tabular form, in the above order.

(1) Lucknow to Benares (main line).

Depart.

6.55* a.m. mixed† to Moghal Sarai.
11.15* a.m. passenger to Rae Bareli.§
4.20 p.m. passenger to Rae Bareli.
10.20 p.m. mixed to Moghal Sarai.
11.0 p.m. passenger to Allahabad.

Arrive.

5.55 a.m. mixed† from Allahabad.
9.18 a.m. passenger from Rae Bareli.§
4.15* p.m. passenger from Rae Bareli.
9.55* p.m. mixed from Moghal Sarai.

* Through train (not terminating at Lucknow); † Mixed passenger and goods; § Not to be confused with Bareilly.

(2) Lucknow to Benares (Fyzabad Loop).

Depart.

6.30 a.m. passenger to Moghal Sarai (for Calcutta).
11.25 a.m. passenger to Fyzabad.
3.15 p.m. passenger to Moghal Sarai.

Arrive.

5.30 a.m. mixed from Moghal Sarai.
8.50 a.m. mixed from Fyzabad.
11.55 a.m. passenger from Moghal Sarai.
7.20 a.m. express from Moghal Sarai.

(3) Lucknow to Bareilly, Saharanpur and the North-West.

Depart.

6.15 a.m. passenger to Saharanpur.‡
12.0 noon passenger to Moradabad.
4.35* p.m. passenger to Dehra-Dun.
11.0* p.m. mixed to Saharanpur.

Arrive.

5.50* a.m. mixed from Saharanpur.‡
10.50* a.m. passenger to Dehra-Dun.
3.30 p.m. passenger from Moradabad.
8.28 p.m. passenger from Saharanpur.

* Through train (not terminating at Lucknow); ‡ For North Western Railway.

It will be seen from the above tables that there are four trains in each direction daily (exclusive of mails) between Lucknow and Benares, eight in all, five of which travel *viâ* the Fyzabad Loop. Between Lucknow and Bareilly there are also four up and four down trains, of which two in each direction run through to Saharanpur. Rae Bareli has two trains each way and Fyzabad, Allahabad, Dehra-Dun and Moradabad one each.

With regard to the metre gauge lines, the Rohilkand and Kumaon Railway has three up and three down trains daily between Lucknow and Bareilly, *viâ* Sitapur, leaving the Junction station at 6.15 a.m., 3.40 p.m. and 9.15 p.m., and arriving from Sitapur at 8.30 a.m., 1.15 p.m. and 7.45 p.m.

As before mentioned, the Bengal and North Western Railway provides a "shuttle" service between Lucknow Junction and Aisbagh Junctions, connecting with the company's trains to and from Cawnpore. There are therefore six Bengal and North Western trains arriving at and departing from Lucknow Junction daily.

There now only remains the local service between Lucknow and Cawnpore to receive attention, and this may be dismissed in a very few words. In spite of the heavy traffic between the two cities, there are only four trains in each direction daily. There are two explanations which may be suggested for this apparently meagre service. Firstly, the third class seating capacity of the trains is immense, and as the preponderance of passengers is overwhelmingly native, an exceedingly large number of persons are conveyed by each train. Now it is of no great consequence to the native at what hour he arrives at his destination, provided he does get there eventually. Therefore a frequent service of trains throughout the day is not demanded, a few heavy trains, of great carrying capacity, fulfilling the needs of the situation equally well.

Secondly, a further service is provided by the Bengal and North Western Railway,

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which has three up and three down trains daily. This company's trains take considerably longer over the journey than those of the Oudh and Rohilkand Railway, the average time working out at three hours, as against the two hours of the broad gauge line. If we sum up the whole of the services above described we find that there are forty-eight passenger trains dealt with daily at Lucknow Junction station.

We have now completed our brief survey of the passenger services, but mention must be made of the tremendous local and through goods traffic handled by the Oudh and Rohilkand Railway. Immense through trains from Bengal to the Punjab and north-west are continually passing through Lucknow, hauled by large 0–6–0 locomotives, while the local traffic to and from Cawnpore has already been referred to. The through goods, as a rule, travel *viâ* the Fyzabad Loop between Benares and Lucknow, thus relieving the main line, which is single track throughout.

In conclusion, it may perhaps be permitted to refer briefly to what may be termed the intense "human" interest which attaches to any large railway station, but which is perhaps present in a greater degree in India than in any other country.

The arrival and departure of an important long-distance train is a sight which once seen is not easily forgotten by those possessed of any imagination. Among the crowds that throng the platforms and fill the long bogey coaches may be found the representatives of fifty different races; many of them differing as widely in their appearance, language, religion, colour, dress and character, as do the nations of Europe. Tall, bearded Sikhs from the Punjab; swarthy, fierce-looking Pathans from the North-West Frontier; sturdy little Ghurkas from Nepal, their cheery faces and generally light-hearted demeanour contrasting pleasantly with the very solemn, almost hostile, appearance of their fellow travellers. Here and there is a bespectacled "babu" from Bengal, probably a "pleader," unmistakeable in his little round black hat and black cotton jacket, and with the inevitable gamp under his arm—an infallible sign of smug respectability.

Occasionally one may see a traveller from Kashmir, easily recognised by the light colour of his skin—lighter, indeed, than that of an Italian. And lastly the British, all too few in number, soldiers in khaki drill, and civilians, conspicuous in their white silk suits and topees, complete as cosmopolitan a crowd as could be found in any quarter of the globe.

All shades of colour are there, from black to white. The confusion is prodigious. The natives struggling and pushing to obtain a wash at the station water pipe, or intent on attracting the attention of the various fruit and refreshment "wallahs" who range up and down the platform. There is little of the "Silent East" here. The noise which ascends to heaven is colossal, everyone shouting in strange sounding languages at the top of his voice. In sooth, it would have caused the Tower of Babel to collapse for very shame. And behind it all, and presenting a vivid contrast to this noisy, Oriental crowd with its riot of colour, is a wholesome piece of western civilisation; nothing less in fact, than a Wheeler's bookstall, full of the latest London illustrated papers and magazines, and well stocked with all the popular sevenpenny novels.

Indeed, a day spent at a large Indian railway station, so far from being wasted, is an education in itself, and full of interest to the railway enthusiast.

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Locomotive and Train Working in the latter part of the 19th Century.

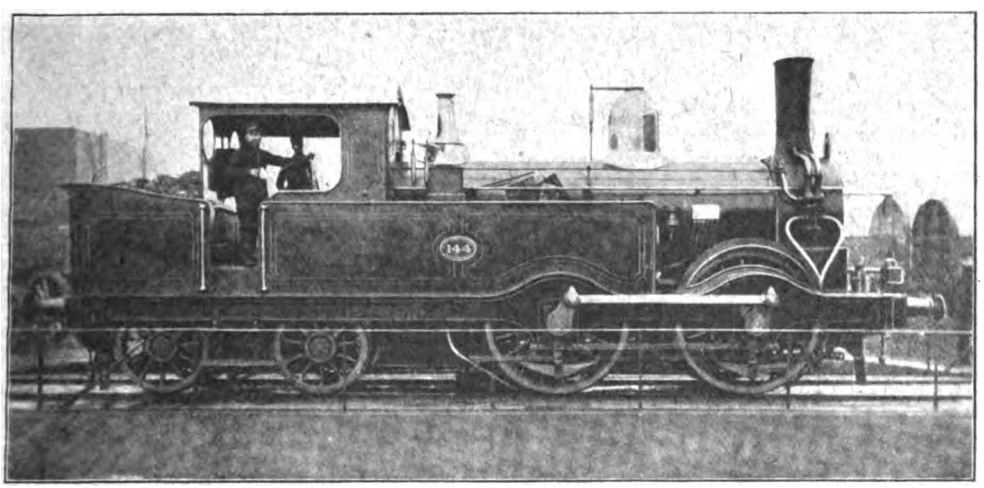
SOUTH EASTERN RAILWAY. [No. III.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

(*Continued from page* 15, *July* RAILWAY MAGAZINE.)

DURING 1877–8 there appeared from Ashford Works nine 0–4–4 bogie side tank engines (144 class), of Mr. Mansell's design. These were pleasing looking engines with 5 ft. 7½ in. coupled wheels and 17 in. by 24 in. cylinders, polished brass domes, double frames, and a very large tank capacity of 1,300 gallons. They were used principally on the London–Greenwich local trains, and lasted only for some 15 years, when they were broken up without undergoing rebuilding. They were always known as the "Gunboats."

The locomotive department at the end of 1877 was somewhat in a state of flux, when just afterwards our old friend Mr. James Stirling, whom we last met at Kilmarnock (RAILWAY MAGAZINE, September, 1916, page 186), arrived from the West Coast of Scotland to introduce some ozone from that district. In our previous pages he left us after having just designed his first 0–6–0 goods engines for the Scottish railway. The Stirling family predilection for four wheels coupled engines for goods traffic has already been mentioned, but whatever his opinions may have been north of the border, he seems to have come to the immediate conclusion that the air of Kent and the south coast of England was more favourable to the growth of the six-coupled variety, and henceforth we meet no more with four-coupled "mixed traffics." I must at once admit that this was at one time somewhat of a puzzle to me, for I should have thought that the South Eastern, with such a large volume of passenger traffic at moderate speeds, would have been an ideal line for his Glasgow and South Western.



Photo] [*Locomotive Publishing Co., Ltd.*

MR. MANSELL'S 0-4-4 BOGIE TANK ENGINE, NO. 144.
Type known as "Gunboats." Wheels, 5 ft. 7 in. Cylinders, 17 in by 24 in.
Built at Ashford Works, 1877-8.

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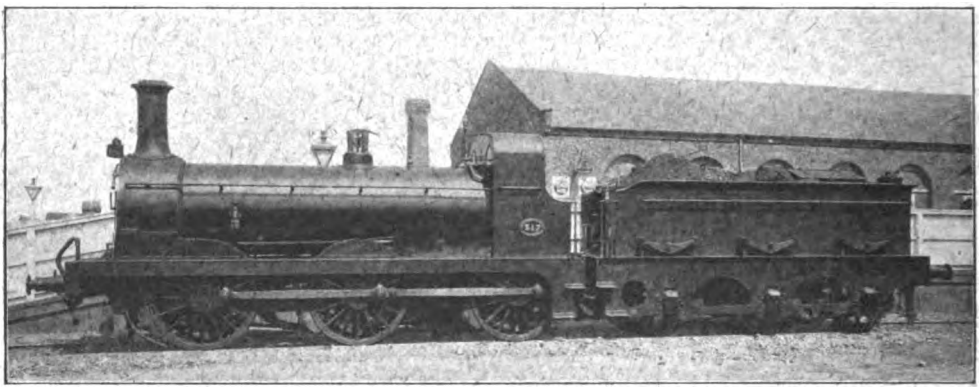

Photo] [*Locomotive Publishing Co., Ltd.*

MR. J. STIRLING'S STANDARD GOODS ENGINE, NO. 317.
Wheels, 5 ft. 1 in. Cylinders, 18 in. by 26 in.

0–4–2 engines, which were powerful machines capable of tackling any sort of train, goods or passenger, except, of course, the fastest expresses. However, Mr. Stirling must have had his very good reasons for using the six-coupled design exclusively. But he brought with him the "family heirlooms," viz., the domeless boiler and the Stirling cab.

The new goods engines, 20 in number, which were built by Sharp Stewart and Co. in 1878, had wheels 5 ft. 1 in. diameter with 18 in. by 26 in. cylinders, and were of practically the same design as the Glasgow and South Western "Black goods" which he had just left behind at Kilmarnock, and with slight alterations these remained the standard type of goods engine on the South Eastern for the whole period of over 20 years, during which he controlled the locomotive department at Ashford. No fewer than 122 of these engines were constructed, of which 65 were built at various periods until 1897 by Messrs. Sharp Stewart and Co. and the other 57 came out from Ashford Works.

It was mentioned when dealing with the Glasgow and South Western Railway that Mr. James Stirling was one of the two pioneers in the introduction of the leading bogie in connection with the now universal British type of inside cylindered 4–4–0 engine. Consequently, as was to be expected, he also brought this feature with him, and his earliest passenger engines built at Ashford during 1879 to 1881 were the first South Eastern tender engines to be provided with bogies. The engines in question were twelve in number (Nos. 19, 36, 67, 157, 159, 160, 163, 165, 166, 175, 176 and 179), and may be described as heavy passenger rather than express engines, for they had coupled wheels only 6 ft. in diameter, with 18 in. by 26 in. cylinders. Their principal rôle was the working of the heavy seaside fast trains to Ramsgate and Hastings. On the branch from Tonbridge Junction to Hastings, there are many severe banks up and down, half the distance being 1 in 132 or steeper (one short length is 1 in 53). Of the entire run from London to Hastings one half averages about 1 in 130. The boiler was of the same size as that used in the goods engines and bogie tank passenger engines, with 859 sq. ft. of tube surface and 89 sq. ft. of firebox heating surface, and the grate area was 15·5 sq. ft. The weight in working order did not exceed 38 tons, and the tenders carried only 2,000 gallons of water. The Stirling domeless boiler was never a large one, as modern ideas of boilers go, and in this respect also the family tradition was also in evidence. Whether it was not somewhat on the small side for 18 in. cylinders is a matter of opinion, but the Stirlings always maintained the dictum enunciated by the late Mr. D. K. Clarke, that it was not so much the quantity of heating surface within certain limits that mattered, so much as its proper distribution, and above all the avoidance of overcrowding a large number of tubes so that the steam was not free to rise. And it should be noted in this connection that the boiler was 4 ft. 4 in. in diameter at a time when other engineers were getting 1,100 sq. ft. of tube heating surface and more into boiler barrels 4 ft. 2 in. diameter.

I have no records whatever of the performances of the above 6 ft. coupled engines, and know very little about their work; they

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were broken up in 1907–9 by Mr. Wainwright, when they had become somewhat too small for modern exacting conditions.

Whatever the peculiar conditions that obtained on the Glasgow and South Western in regard to passenger tank engines, these evidently did not apply to the South Eastern. One of the first things Mr. Stirling probably noticed on taking up the reins at Ashford was the large amount of local work, especially in the London district, that was performed by engines running tender first. The South Eastern driver of the "seventies" must have been a very hardy individual, for he had to face the weather on an unprotected cabless locomotive even when he ran in the normal position of engine first.

In 1880 there appeared the first members of a long family of the well known 0–4–4 bogie tank engines, and by the end of 1897 there were no less than 118 of this well known class in service, and there is no doubt but that they have been most excellent and useful engines.

The coupled wheels of these engines are 5 ft. 6 in. in diameter and the cylinders 18 in. by 26 in. The boilers were of the same standard dimensions as in the goods engines and 6 ft. coupled engines mentioned above. The earlier engines built until about 1885 had bogie wheels of the size almost always used on most railways for engines of this type, viz., 3 ft., but from this time the bogies were constructed with larger 3 ft. 9 in. wheels, and made standard with those of the main line express engines.

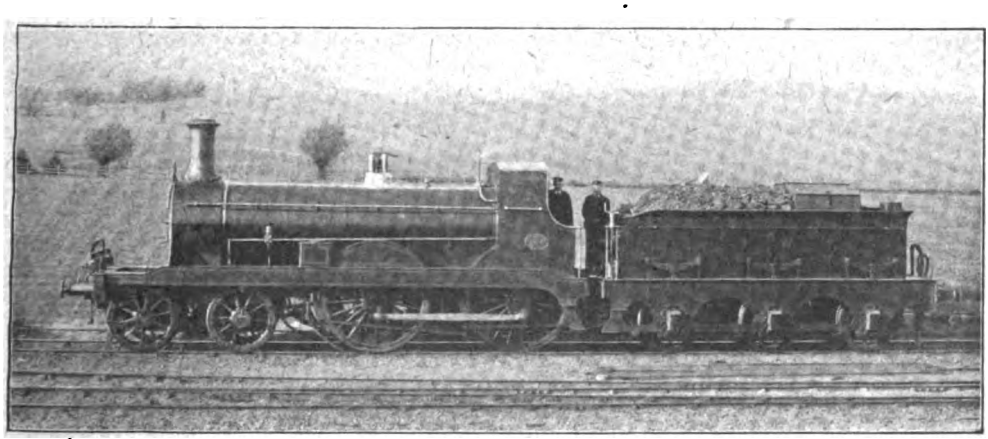
Some of the class were fitted with low chimneys and condensing apparatus for working a service of trains to Wood Green on the Great Northern through the Metropolitan extension tunnels.

Sixty of the class came from the works of Messrs. Neilson and Co. from 1881 to 1897, 10 were built by Sharp Stewart and Co. in 1893–4, and the remainder had their origin at Ashford.

Mr. Stirling did not scrap the older engines of his predecessor's design in any indiscriminate fashion, but rebuilt most of the old standard 6 ft. coupled engines and the goods engines with domeless boilers. Beyond the new boilers, hardly any alteration was made in them, even the cylinders were not enlarged, and the old open splashers with brass bands remained. Of course they were gradually broken up in time as they wore out, but there were still a number in service when the fusion of the South Eastern and Chatham Railways took place in 1899 and Mr. Stirling retired.

Old No. 1, a rebuilt Cudworth goods engine, together with Mr. Stirling's goods engine 294, got into trouble at Sevenoaks in the early morning of June 7th, 1884. The two were working the 6 p.m. up goods from Deal and ran into the rear of a Folkestone up goods, and the driver and fireman of No. 1 were killed. The result of this accident is shown on page 115.

In 1883 there were only nine express trains on the South Eastern, on the basis of Foxwell's definition of an "express," *i.e.*, a train which completes its journey at the rate of 39–40 miles per hour. Of these the Cannon Street and Dover Town (74½ miles) Continental and Mail expresses claimed



Photo] [*Locomotive Publishing Co., Ltd.*

MR. J. STIRLING'S FIRST SOUTH EASTERN RAILWAY BOGIE ENGINE.
Wheels, 6 ft. Cylinders, 18 in. by 26 in.
Built at Ashford Works, 1879–1881.

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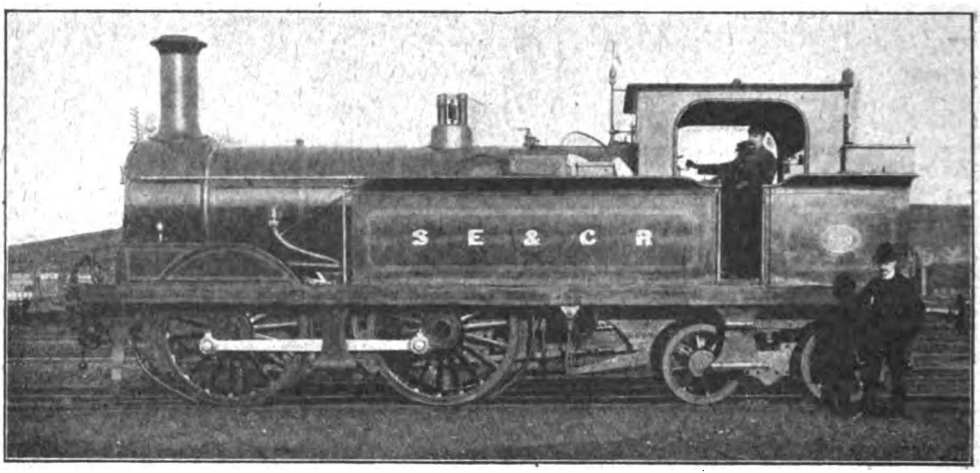

Photo] [*Locomotive Publishing Co., Ltd.*

MR. J. STIRLING'S BOGIE TANK ENGINE, NO. 330.
Wheels, 5 ft. 7 in. Cylinders, 18 in. by 26 in.

seven (three down and four up), whilst two trains between London Bridge and Ramsgate (84¼ miles) accounted for the balance by scraping in at a speed of 40·8 m.p.h. running average, but owing to stops taking 6 min., their actual journey speed was only 39 m.p.h. There were also the two "Tidal" expresses serving Folkestone (69 miles from Cannon Street) at 39½ m.p.h., and one up fast train from St. Leonard's that ran the 59 miles to London Bridge with one stop of 2 min. in 92 min. The running average of this train was 39½ m.p.h. Finally another seaside train ran the 54 miles from Ashford to London Bridge at 41½ m.p.h. The fastest train was the morning Continental, which left Cannon Street at 7.48 a.m. and ran through to Dover at 45 m.p.h.

If any one desired to sample the South Eastern in its palmiest state, I should have recommended him to try the Reading line. Reading to Red Hill is 46¼ miles, and the fastest train appeared to average about 4 miles an hour, with occasional spurts to 5. I know that this is not far from the mark, because I once tried it myself, and decided to walk if ever I had to go that way again. This feat was performed by the Cudworth 6 ft. coupled engines at the head of a string mostly consisting of "openwork" third class coaches.

In 1884 Mr. Stirling brought out the first of a large family of the celebrated standard 7 ft. coupled engines, which have so long been a feature of the South Eastern, and on their appearance the Cudworth singles resigned from the Dover mail expresses.

The first appearance of the new engines (illustrated by No. 198, page 116) was the cause of a rather amusing reference to them and their future deeds on the part of one of the great London daily papers. The average newspaper reporter may be excellent in his faithful and detailed descriptions of the methods by which a man falls off the roof of a house, or of what happened when "a heavily laden omnibus proceeding down the Old Kent Road at about 7 o'clock last evening," collided with something that ought to have been in the next street, but wasn't. But when he tackles the little problems and incidents that arise on a railway, he usually manages to tie himself into a most hopeless knot, and in his innocence evolves a number of tall statements for that section of the confiding British Public which reads his paper to swallow. At the period in question whispered rumours reached the editorial office concerning the new engines, and that the South Eastern was going to attempt something very big. As a result of this a scribe was duly despatched to investigate and report upon so important and unusual a matter. The scribe probably hied him to Cannon Street, but whether he culled his information there, or travelled further afield to Ashford Works, did not appear. If the latter place were visited, it seems likely that on his rounds he got too close to the tensile testing machine, and had his "leg badly pulled." Anyway he returned with the information, and the great daily—it was really a very great daily—solemnly printed it, that the new engines were to

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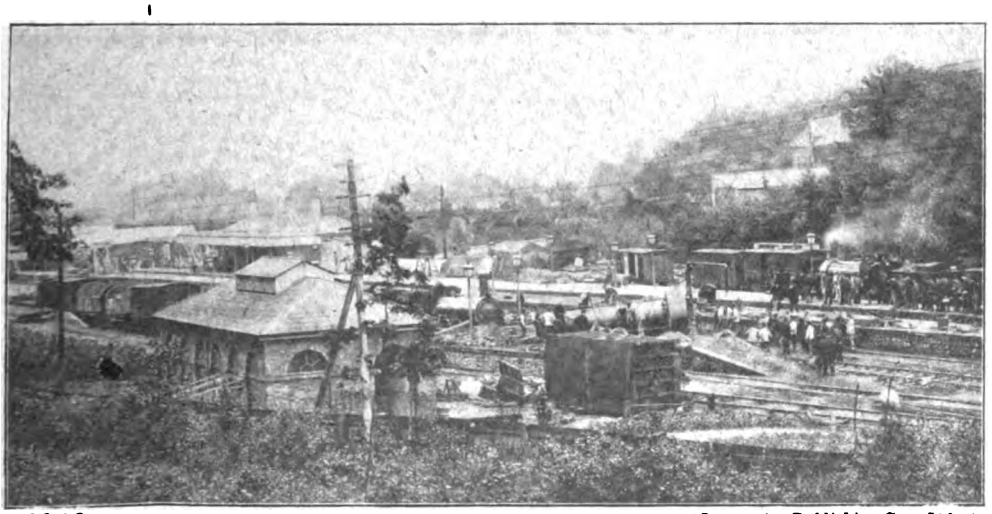
run from London to Folkestone in one hour. The distance is 69 miles, but they didn't tell him that. Then he proceeded to unburden his soul of the following profound wisdom :— "As they were to have leading bogies, the action of the engines would be considerably modified." Having arrived at this interesting point, the bogie centre pin must have unfortunately got entangled in the regulator handle, for the resulting "modifications in the action of the engine" that ensued were such that the scribe stopped and gave up his journalistic train, leaving the wondering British Public stranded.

To return, however, to the new engines, these may perhaps be described as an outgrowth of Mr. Stirling's famous Glasgow and South Western 7 ft. bogie engines, but were neater in their outlines and the curves of the framing than their Scotch cousins. Although the valve chests were placed between the cylinders, these had the large diameter of 19 in., with a 26 in. stroke. At this time the only other 19 in. express engines in the country were Mr. S. W. Johnson's Midland locomotives with Joy's valve gear, and valves on the top of the cylinders, which came out contemporaneously with the new South Eastern engines. But that Mr. Stirling was in some doubt as to the success of such large cylinders seems to be evidenced by the fact that three or four of them were built with cylinders only 18 in. in diameter.*

* Mr. James Stirling informed me that "the 18 in. engines were bored to 19 in. to find out if the 19 in. cylinders would be successful."

The domeless boilers were larger than the hitherto adopted standard, being 4 ft. 4 in. diameter by 10 ft. 4½ in. long, and containing 202 1⅝ in. tubes, which gave a heating surface of 917 sq. ft., to which a larger firebox added 103 sq. ft., making a total of 1,020 sq. ft. The grate area was 16·78 sq. ft. and the total weight in working order 42½ tons, of which 28 tons 2 cwt. was carried on the coupled wheels.

The journalistic scribe mentioned previously seems to have had bogies very much in mind. It is just possible that what he was really trying to explain was that Mr. James Stirling's bogie had several important differences from the bogies in use on other railways. To begin with, its wheelbase was shorter, being only 5 ft. 4 in. as compared with the more usual 6 ft. 6 in. of most other lines of that date—including the Great Northern bogies of the quite different designs of his brother, Mr. Patrick Stirling. The side play on each side of the centre pin was only ¾ in. The bogie pin passed through a double forked link, which was pivoted on another pin placed 14 in. in front of the main pin. Two smaller links set at an angle supplied the controlling force, through the agency of two indiarubber spring pads through which they passed. The bogie wheels were larger than usual, being 3 ft. 9 in. in diameter. It is impossible to describe this bogie properly without an illustration (and so really after all the scribe must be forgiven), but those interested can find



Photo] [*Locomotive Publishing Co., Ltd.*

THE SEVENOAKS ACCIDENT, JUNE 7TH, 1884.
Goods Engines Nos. 294 and 1.

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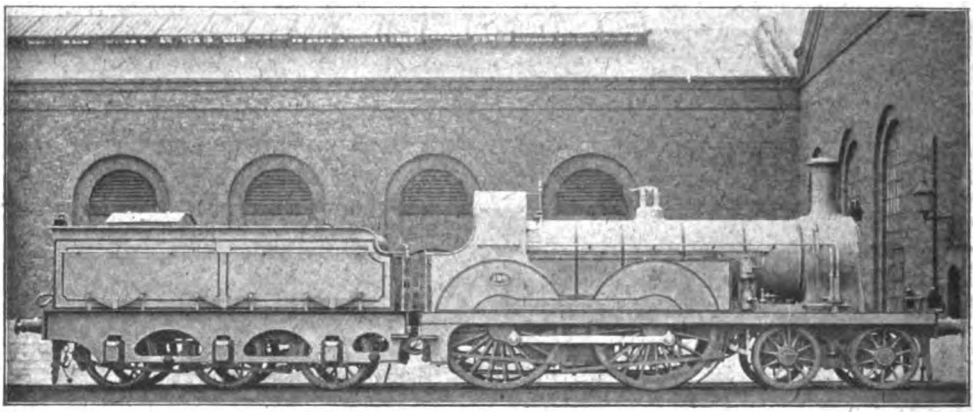

MR. J. STIRLING'S 7 FT. COUPLED STANDARD EXPRESS ENGINE, NO. 198.
Built at Ashford Works, 1884.

drawings of it in the engineering papers of 1889.*

The genesis of Mr. James Stirling's well-known steam reversing gear on the Glasgow and South Western has already been mentioned. It was applied to nearly all the South Eastern engines, including the Cudworth rebuilds. The earlier engines had the actuating cylinders inside the cab, but in the later engines they were placed at the front of the driving splasher in a vertical position so as to act directly upon the reversing shaft. Altogether, inclusive of the later or 440 class, there were no less than 117 of these fine engines put into service. Only a few of the first 1884 batch had the smaller 18 in. cylinders, for the larger 19 in. cylinders proved quite satisfactory in service. Engine No. 240 was exhibited at the Paris Exhibition of 1889 and gained a gold medal. It was afterwards engaged for a short time in running trials on the French railways.

With the first appearance of this class the colour of the South Eastern engines underwent a change, and instead of the old dark green with red-brown under-frames, all Mr. Stirling's engines—passenger, goods and tank—were painted black, lined out with red lines. The change of colour did not, however, extend to the rebuilt Cudworth passenger engines, which still retained their dark green livery as before, and the Cudworth goods engines rejoiced in a plain unlined sea-green hue of an extremely bilious appearance.

Like many other companies the South Eastern made a change in their continuous brakes. Until the early "eighties" the simple Smith's vacuum, similar to that in use on the Great Northern and Manchester, Sheffield and Lincolnshire, was used. When automatic brakes became compulsory, an alteration was made to the automatic vacuum..

By 1888 some three or four additional expresses had been put on, and the speeds of the older ones slightly accelerated. There were now eight up and down expresses between London and Dover, the best of which—the 11.7 a.m. from Cannon Street—averaged 47 m.p.h. over the non-stop run. These trains were first and second class only at express fares. The up and down Folkestone trains were also privileged expresses of the same aristocratic nature, and of these there was one each way that averaged 44 m.p.h. for the through run. St. Leonard's had one express in each direction which made the through run at 40 m.p.h., the time taken being 1 hour 31 min. The two best Ramsgate trains ("Granville" expresses) managed to cover the 84¼ miles to London Bridge at a running average of 40½ m.p.h., deducting time taken for one stop.

Of the actual performances of the 198, or 240 class as they were often called after the Paris Exhibition engine, I have but few records. On one occasion one of them took the afternoon boat express from Dover to Cannon Street (75¼ miles) in 93 min. with a load of 17 coaches. Another of them took 22 coaches up the 12 mile Halstead bank in 21¾ min. One of the earliest of the class with 18 in. cylinders ran the heavy "Tidal"

* It is also illustrated and described in Mr. Ahrons's book, "The Development of British Locomotive Design," published by The Locomotive Publishing Co., Ltd., 3, Amen Corner, E.C.4.—EDITOR.

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express to Folkestone, 71 miles, in 87 min., and climbed the Halstead bank, 12 miles, in 21 min.

Excessive maximum speeds were never to be met with on the South Eastern, and 65 to 66 m.p.h. was the highest. I believe there was some special regulation with regard to this, but whether this was actually the case or not, the fact remains that the drivers always seemed very careful not to exceed it.*

The last decade of the 19th century saw a gradual improvement in many details of the working of this line, notably in the main line carriages. Some very good bogie coaches were put into service, and the six-wheeled coaches of that day were as good as any similar coaches to be found in other parts of the country. Moreover, the Dover and Folkestone expresses included Pullman cars, both first and second class.

But the old "box-wagon" thirds were still painfully in evidence on the North Kent and other branch lines. The affection which the South Eastern shows for these antiquated vehicles is very touching—I have seen a few of them quite recently in their old haunts. But I have also quite recently seen some on the "Chatham" section and also on the "Brighton" Railway, that were even a few shades worse than the South Eastern variety.

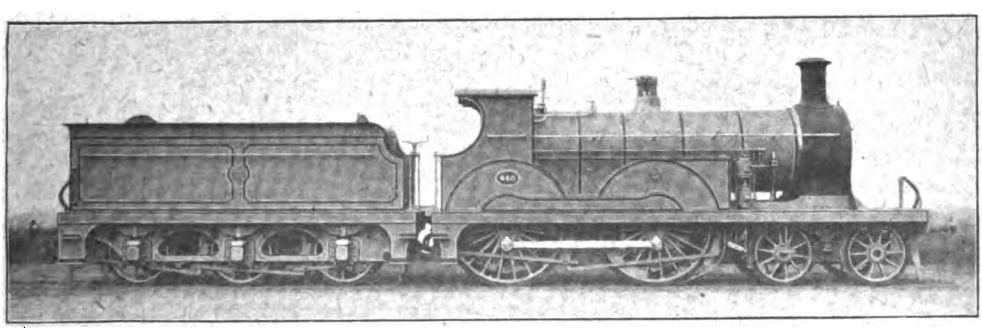
The speed of the Dover expresses remained, I believe, the same in 1897 as it was in 1888, viz., 96 min. for the 75½ miles from Cannon Street. Folkestone (Central) to Charing Cross, 70 miles, was booked to be performed in 94 min., a speed of 44·7 m.p.h.

But in one of his bulletins to the International Railway Congress (1898) the late Mr. C. Rous-Marten remarked, "On the South Eastern nothing has to be noted except that the quickest times of its principal trains between London and Dover are some minutes slower than they were ten years ago. Here the 'progress' has been backward."

Finally there remains to be mentioned Mr. Stirling's last class of express engines, viz., the 440 class. These engines, Nos. 440–459, were built in 1898 by Messrs. Neilson Reid & Co., and a few more were also constructed at Ashford. They formed the last series of the 117 7 ft. coupled 4–4–0 engines, and may be described as an enlargement of the 240 class. In the new engines the cylinders (19 in. by 26 in.), together with the wheels and wheelbase, remained as before, but the diameter of the boiler was increased to 4 ft. 8⅛ in., with an increase of the heating surface from 1,020½ to 1,100 sq. ft. and an increase in weight from 41½ to 46 tons. The tenders were of a new design with springs under the platform. The whole appearance of the engines was greatly improved by the increased size, and the raising of the boiler centre. And, wonderful to relate, there also appeared a new cab of the shape used by so many British lines, and perhaps more like Mr. Dean's Great Western design than any other. The 440 class were the only tender engines designed by a Stirling without the family cab.

The 198 or 240 class are for the most part now running with new *domed* boilers (as illustrated by No. 140, page 118). Mr. James Stirling, who, I am extremely pleased to add, is still with us,† and living in well-earned

* Since the above was written, this question of maximum speed was mentioned to Mr. James Stirling, who informed me that the rule book gave 60 m.p.h. as the maximum speed. The traffic and other authorities would not take the responsibility of altering this, and Mr. Stirling added that he would not therefore make any change on his own initiative, and consequently he "could not even get running down hill."



MR. J. STIRLING'S LAST DESIGN OF EXPRESS ENGINE, NO. 440.
Wheels, 7 ft. Cylinders, 19 in. by 26 in.
Built by Neilson Reid & Co., 1898.

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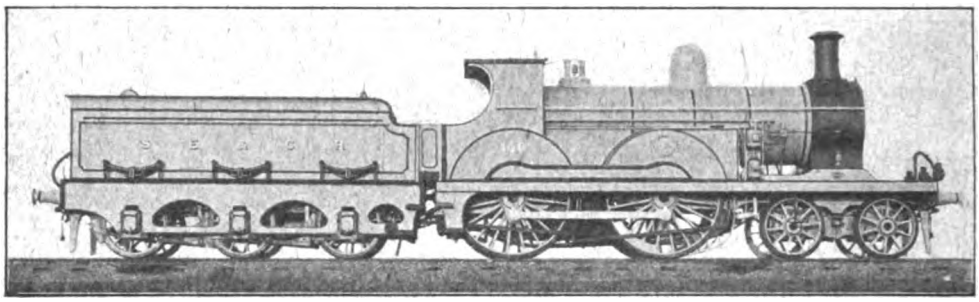

NO. 140, ONE OF MR. J. STIRLING'S 4-4-0 ENGINES (198 OR 240 CLASS).
Rebuilt by Mr. Wainwright with domed boiler.

retirement at Ashford, may possibly now look upon his old engines with somewhat mixed feelings, having laboured so long and so faithfully in the company of the domeless boiler. The old-time philosopher and sage who wrote Ecclesiastes I., 2–4, may also have possibly been something of an engineer.

The Stirling traditions and "family heirlooms" are now in the keeping of Mr. Matthew Stirling,* of the Hull and Barnsley Railway, where the domeless boiler and Stirling cab still flourish.

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† It is with deep regret that I have to add that three weeks after the above was written, Mr. James Stirling passed away suddenly at his home at Ashford at the age of 81. He took the greatest interest in locomotive and railway matters until the day of his death, and almost his last act in this connection, only a few days before he passed away, was to do me the great kindness of reading through that portion of my manuscript of the above article which deals with his connection with the South Eastern Railway from 1878 to 1898, and to send me a few comments upon it, which have been embodied in the text.

Mr. Stirling did much towards the development of the British locomotive. The modern 4–4–0 engine, developed from his 1873 design for the Glasgow and South Western Railway (see the RAILWAY MAGAZINE, September, 1916, page 185), owes more to his thought and design than to those of any other locomotive engineer.

He has now crossed the bridge over "The Great Divide," leaving behind him the memory of a deep respect, and taking with him the kindest thoughts of all those who formerly worked under him, and who knew him.

* Nephew of Mr. James Stirling.

Since my article in the July RAILWAY MAGAZINE appeared, a London clergyman has kindly favoured me with some additional and interesting notes as to the work of the Cudworth 7 ft. singles.

During the 1874–1878 period there were three of the 7 ft. singles at Dover, Nos. 116, 200 and 204, which worked two trains to London, viz.:—8.45 a.m. up, returning with the 2.50 p.m. down, and the 12 noon up, returning at 4.45 p.m., until at a later date the Dover men began to work some of the "Mail Expresses" instead of the London men. The London engines which ran the day mails, down and up, and the night mails also in both directions, were Nos. 2, 43, 72 and 85. Nos. 81, 199, 201 and 203 worked the following trains:—(*a*) Tidal express to Folkestone down and up, (*b*) Inland mail at about 9 p.m. *viâ* Red Hill, returning with the 1.55 a.m. up. Engines 85 and 199 worked the Ramsgate cheap fast expresses in summer time, but 83 seems to have been stationed at Ramsgate to work a morning express to London, returning at 3.45 p.m.

He also gives the following particulars of the 9.35 a.m. from Ashford, which left Dover at 8.45 a.m. This train, according to the 1877 working time-table, passed Paddock Wood at 10.2, Tonbridge at 10.10, and reached London Bridge at 10.50 a.m. This gives a speed of 45·4 m.p.h. between Ashford and Tonbridge, 41·6 m.p.h. from passing the latter station to the London Bridge stop, and 43·4 m.p.h. for the whole run. The 53½ m.p.h. run, which I mentioned that I could not verify, was, therefore, as far as this train was concerned, a railway myth. But the down morning mail train was actually booked to cover the 26½ miles between Tonbridge and Ashford in 29 min., or at the better speed of 54·8 m.p.h., and the 2.50 p.m. from Charing Cross, which

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passed Tonbridge at 3.51 and arrived at Ashford (stop) at 4.20 p.m., was also booked at the same speed. Better still, the Tidal express in January, 1877, was allowed only 28 min. for the same distance, at the excellent running average of 56·8 m.p.h., though this fast timing was in operation for only a short time. There is no doubt that these "crack" South Eastern trains of 1877 had some very hard running to perform.

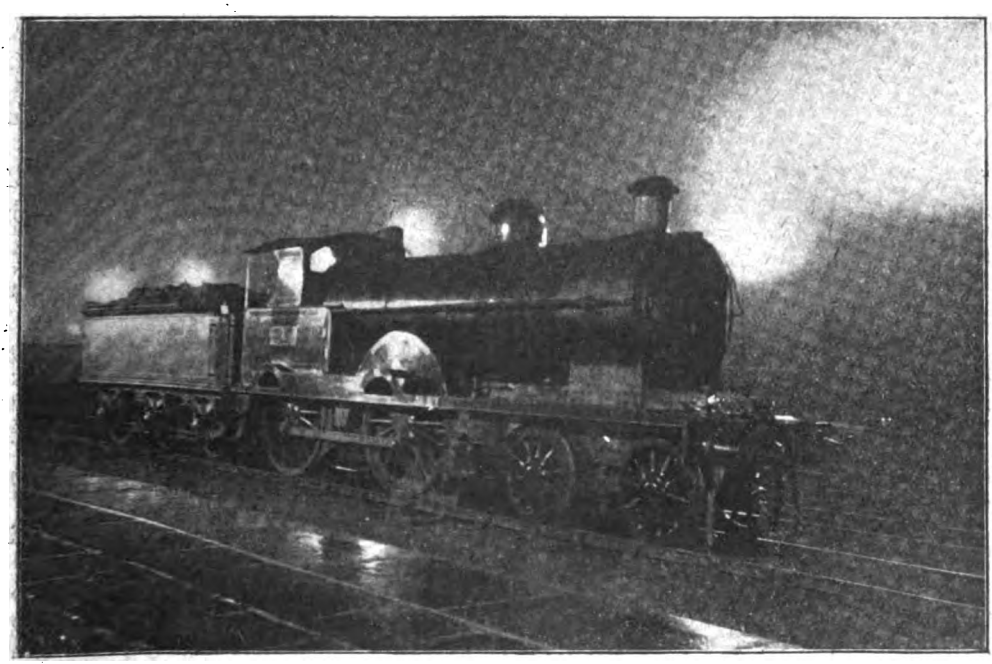
LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with by Mr. E. L. Ahrons are:—

L. & N.W.: Jan., Feb., March, May, 1915.
Great Northern: June, July, 1915.
M.S. & L.: Aug., Sept., Oct., 1915.
Great Western: Nov., Dec., 1915; Jan., Feb., March, April, May, June, July, Aug., 1916.
Glasgow & S.W.: Sept., Oct., 1916.
North Eastern: Nov., Dec., 1916; Jan., Feb., March, April, May, 1917.
South Eastern: June, July, August, 1917.

In September, 1917, Mr. Ahrons will deal with The Lancashire and Yorkshire Railway.

A WET NIGHT AT CREWE.



Photo] [*W. H. Whitworth.*

LONDON AND NORTH WESTERN RAILWAY.
4-4-0 locomotive, No. 1, Class.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper right-hand corner. Questions relating to the names, numbers, dates, dimensions, etc., of locomotives should not be forwarded, neither should queries be of purely local interest. Before asking for information concerning railway history, leased and worked railways, electrically operated railways, rolling stock statistics, notable railway accidents, and the like, RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book" (2s. 6d. net), the twentieth annual Edition of which is on sale at the* RAILWAY MAGAZINE *Offices, 30, Fetter Lane, Fleet Street, London, E.C.4. By post in British Isles 2s. 11d., Abroad 3s.*

The Longest Intervals between Stations.

We assume that this query applies to the British Isles, and that being so, pride of place must be awarded to the 17 miles 24 chains between Rannoch and Tulloch, on the West Highland section of the North British Railway. The adjacent section of the same line between Rannoch and Bridge of Orchy measures 15 miles 48 chains, without an intermediate public station. In each of these cases, however, there is an intermediate passing place—on the former length at Corrour and on the latter at Gortan—both of which act in the capacity of private stations, where certain local passengers are picked up or set down. Next on the list comes the length of 15 miles 3 chains between Clarbeston Road and Fishguard and Goodwick, Great Western Railway, but this hardly satisfies the conditions of the query as it has an intermediate junction, and also a "halt" midway at Wolf's Castle. In Ireland the Great Southern and Western Railway takes next place with the 14¾ miles from Kildare to Athy, but according to the question, which bars a "junction of any description," this must be cut down to the 12¼ miles between Cherryville Junction and Athy. For the same reason the 14¾ miles between Wadborough and Bromsgrove, Midland Railway, would be "barred," as it is in reality only a "loop," avoiding Worcester, and has several goods depôts *en route*. Thus the longest inter-station distance strictly conforming to the conditions of the question is the 13 miles 48 chains from Athlone to Ballinasloe, Midland Great Western Railway of Ireland, closely followed by the 12 miles 72 chains from Beattock to Elvanfoot, on the main line of the Caledonian Railway.

[Reply to C. E. BEAMES.]

Slip Coaches on the Great Western Railway.

The slip coaches detached from the late 10.30 a.m. "Cornish Riviera Limited" express of the Great Western Railway were at Westbury, for Weymouth; Taunton, for Ilfracombe, and Exeter, for Torquay, the first stop of the main train being Plymouth (North Road). The distinction of slipping three portions without intermediate stoppage (confined entirely to the Great Western Railway) was shared by certain down trains on the Birmingham route prior to the war. The 9.10 a.m. *ex*-Paddington slipped at Princes Risborough, Banbury and Leamington; the 2.35 p.m. at Banbury, Leamington and Wellington; the 4 p.m. at Bicester, Leamington and Knowle, and the 6.5 p.m. no less than *four* times—at Banbury, Leamington, Lapworth and Wellington, although the Wellington slip (as in the case of the 2.35 p.m. down) was attached at Birmingham, and not carried from Paddington.

[Reply to C. E. BEAMES.]

Spring-Balance Safety-Valves.

The apparatus on the domes of early Midland engines, to which you refer, is a spring-balance safety-valve, the spring being a powerful coil contained in the vertical pillar, so that the steam has to overcome the leverage exerted by the spring through the horizontal bar before it can escape. The reason for arranging safety-valves of this and other types on the domes of locomotives has of recent years been with a view to avoiding the cutting of an additional hole in the boiler shell in order to attach safety-valves in their more common position. But in earlier days safety-valves were frequently provided both over the fire-box and on the dome, and Mr. S. W. Johnson adhered to this practice in most of the locomotive types

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he designed for the Midland Railway, excepting his latest 4–4–0 and 0–6–0 classes.

[Reply to HENRY WOOD.]

Oatlands and Maybury Signalling Alterations.

eW are officially informed by the London and South Western Railway that the down through and down local starting signals at Oatlands were dispensed with owing to their becoming unnecessary by reason of changes in the train working; this left the two distant arms for Weybridge remaining on the bracket post.

Neither of these distant arms are at present replaced to the "on" position until the train arrives at Weybridge; formerly, when the starting arms existed on the bracket signal post the distant arm went to the "on" position simultaneously with the starting arm above it as such arms are, of course, always slotted one with the other. There is nothing unusual in the arrangement.

[Reply to J. D. THOMSON.]

London and South Western Railway Locomotives.

Mr. E. L. Ahrons states:—

There were 12 goods engines by Messrs. Beyer Peacock and Co., 1878, with 5 ft. wheels and 17 in. by 24 in. cylinders. Where were Nos. 151 (*Montrose*), 152 (*Marmion*), 160 (*Thames*), 162 (*Severn*), 229, 230 and 368 to 373. Of these several were rebuilt 1886–1891 by Mr. Adams. Most of them had O placed in front of their numbers by Mr. Drummond, when relegated to the duplicate list. All of them had inside frames only, and most of them were at one time to be seen on the line between Southampton and Weymouth. 290, a double framed goods engine became 351 in 1898 and 0351 in 1900. How many of these older engines are still at work I do not know.

[Reply to C. E. MITCHELL.]

Limited Trains.

The title of "Limited" is probably of American origin, and is applied to a train having limited and numbered seating accommodation, which may be reserved in advance. It has not found much favour in this country, and probably the only train immediately prior to the war which came under this description was the "Southern Belle" of the London, Brighton and South Coast Railway. The "Cornish Riviera Limited" express of the Great Western Railway began its career strictly as a "limited" train, but latterly this title could not be applied with any accuracy, as its composition expanded with the traffic to 14 or 15 vehicles at times of special pressure, *i.e.*; it became "unlimited" in its accommodation, as any ordinary train.

[Reply to R. WHEATLEY.]

Belpaire Fire-boxes on the London and North Western Railway.

Until the advent of the 4-cylinder 4–6–0 "Claughton" type engines in 1913, the only engines on this line equipped with Belpaire fire-boxes were the Webb 4–4–0 compounds Nos. 1929, *Polyphemus*, and 1930, *Ramillies*. These engines belong to the "Jubilee" class and were turned out from Crewe in 1900, but were re-built by Mr. Whale shortly after his accession to power with new boilers having fire-boxes of the Belpaire pattern. *Polyphemus* is still running in this condition, but *Ramillies* has now been again re-built as a 2-cylinder simple, similar to *Renown*. Mr. Whale at the same time fitted an experimental fire-box of a type resembling the Belpaire to No. 1880, an 8-coupled mineral engine, but on a subsequent re-building this was removed.

[Reply to J. R. WHITAKER.]

Methods of Connecting.

When the four cylinders are placed in line and drive the same axle it simplifies the steam piping for the cylinders. There are fewer joints to keep tight. Owing to the fact that all connecting rods are the same size and weight and other motion parts the same, the reciprocating, etc., parts balance one another. With divided cylinders the steam piping is more complicated, and in many designs there is a lack of uniformity in the sizes and weights of parts of the running mechanism. There is, however, possibly some advantage with the latter arrangement in the matter of weight distribution, as there are two pairs of directly driven wheels instead of one. This, however, is not a matter of much importance.

[Reply to PRIVATE JOSLIN.]

London and South Western Railway Locomotive History.

The London and South Western Railway engine which the late Mr. Adams converted into a two-cylinder compound was, says Mr. E. L. Ahrons, No. 446, a 4–4–0 express engine, with 7 ft. coupled wheels and 18 in. by 24 in. outside cylinders. One of the cylinders was replaced by a L.P. cylinder 26 in. diameter. Mr. Adams gave an account of this locomotive engine in the discussion on Mr. Worthington's paper, Proceedings Inst. Civil Engineers, January, 1889. There

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is no trace of any particulars of its performances being published. After running a few years it was re-converted to a simple engine. The original conversion to compound was made about 1886.

[Reply to A. W. H. SOLOMON.]

Pilot Engines.

The title in the July Magazine "A Scottish Pilot" is quite correct. Engines used in shunting and working trips between two not far distant points are called pilots. The title is by no means confined to the engine sent in advance of Royal special trains. An additional engine placed on a train when the load is too heavy for the train engine is likewise a pilot. At one time a pilot engine with a pilotman was often used in single line working, the engine being employed to haul every train in either direction until the other line was cleared and ordinary working resumed. Later the practice became more general of employing a pilotman without an additional engine.

[Reply to ALEC MACADAM.]

Midland Railway History.

The Syston and Peterborough branch was opened from Syston to Melton Mowbray on September 1st, 1846. At the other end of the line the portion from Stamford to Peterborough was opened on October 2nd, 1846. The intervening section between Melton Mowbray and Stamford was not ready till March 20th, 1848, when it was opened for through coal traffic, and on May 1st following for passengers.

[Reply to DAVID HAYNES.]

Speeds of George Stephenson's Engines.

The *Rocket* attained a speed of 29 or 29·5 m.p.h. in competition with other engines, and about 36 m.p.h. when conveying Mr. Huskisson to the hospital after he had been knocked down on the railway.

In 1830 the *Planet*, a Stephenson locomotive, took a train weighing 76 tons from Liverpool to Manchester in 2 hrs. 30 min.

[Reply to J. A. O'CONNELL.]

Locomotive Numbering.

No other British line has so well-defined and ordered a system of locomotive enumeration as the Midland Railway, whose practice was given in the June issue. It would be absolutely impossible to compress within the limits of our space the particulars you desire relative to the engine numbers of the London, Brighton and South Coast Railway.

[Reply to C. E. DEBNEY.]

"Fixed" Distant Signals.

Signals referred to in this query as "unworkable" are presumably fixed distant signals. They are used by most companies at certain points, such as approaches to swing-bridges, etc., where it is necessary to give a permanent warning for the reduction of speed, and so are fixed in the danger position. [Reply to HENRY WOOD.]

Standedge Tunnels, London and North Western Railway.

Between Diggle, which is 15 miles from Manchester (Exchange station), and Marsden, which is 24¼ miles from Leeds (New station). For lengths of tunnels, see page 30, Railway Year Book, 1917.

[Reply to C. E. BEAMES.]

Pillars on Locomotives.

In engines where the feed water is heated, domes or pillars are sometimes fitted as a receptacle to which the steam is delivered before it reaches the feed water; in others the pillar is merely an air vessel.

[Reply to R. D. GAULD.]

Mallet Compound Locomotives.

As in any 4-cylinder locomotive compound system, the exhaust of a Mallet compound is from the two low-pressure cylinders, and would therefore sound the same as that of a 2-cylinder simple engine.

[Reply to J. R. BLABY.]

"Stumpf" Cylinders.

The 4-6-0 superheater mixed traffic locomotive No. 825, of the North Eastern Railway, is the only engine running in the United Kingdom with the "Stumpf" arrangement of cylinders.

[Reply to W. S. MUNRO.]

"Mikado" Wheel Arrangement.

Wheel arrangement of a "Mikado" locomotive is 2-8-2. See Diagram of Locomotive Wheel Arrangements, page 51, Railway Year Book, 1917.

[Reply to T. GROVE WHITE.]

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British Railway Service and the War. [XVI.]

AT the recent annual meeting of the Railway Benevolent Institution, the President, the Rt. Hon. Lord George Hamilton, gave striking testimony of the splendid efficiency of the British railway service in regard to war-time working.

"Everybody who has travelled abroad," declared Lord George, "knows very well that as regards punctuality, convenience, safety, and civility, the railway system of Great Britain stands unrivalled. But some of the critics of the British railway system used to say: 'Your system is organised for peace; should we become involved in a war, your system will not be able to stand the test that will be imposed on it.' But it has stood marvellously well the test that was imposed on it nearly three years ago, when this country was forced into war. There has been nothing more remarkable in the history of railways than the manner in which our Expeditionary Force was picked up from all parts of the country and taken over to France at night with such rapidity and secrecy that our enemies, notwithstanding the mass of spies they had in this country, did not know that the troops had departed. It has been communicated to me that the railway authorities and railwaymen estimated that in the multiplicity of sidings which had been made every train as it arrived could be detrained in twelve minutes, and even if in some cases that were not effected the train would be shunted on to another siding and dealt with there. I am credibly informed that in the early stages of the war troop trains were detrained within ten minutes of their arrival."

"But," continued the President, "the arrival and despatch of troops was not all. After a little while it became clear that the troops were almost secondary to munitions, and the peace shops had to be converted into shops for the manufacture of munitions. Those munitions as manufactured had to be conveyed to the port and over to the other side, and the low proportion of casualties during the last few months has been due to the efficiency of railway transport facilitating the transfer to the front of that vast amount of munitions which they succeeded in collecting from various parts of the country."

"I do not know whether you have read the despatch which Sir Douglas Haig recently wrote reviewing the operations that have taken place during the last five or six months. He attaches great importance to the admirable work done by the transport corps and the railway battalions. Those bodies are largely composed of railwaymen. A considerable number of those working over there are men over military age. One of my sons has told me that it is quite delightful to see how the transport corps does its work. Although they are constantly subjected to shell fire, they take that as a matter of course in their day's work. You may take this almost flattering approval of the way in which railwaymen have done their work as evidence that it is largely due to the railway workers here and on the other side of the Channel that we are achieving the successes that have recently been secured with such comparatively slight casualties to our men."

"I understand that the railways in France are almost one succession of Clapham Junctions and Willesden Junctions, such is the extent to which railways are being used in connection with the fighting forces. The railway companies have responded not only to the demands of Great Britain in connection with the war, but also to those of our Allies all over the world. Railways have been made in Mesopotamia and Egypt and other places from British materials, the lines are run by British locomotives and rolling stock, and it is no secret that one of the difficulties in running passenger traffic in this country is occasioned by this great demand for locomotives, not only for use by us, but also by our Allies. Therefore," concluded Lord George Hamilton, "I think that if our railwaymen were popular before the war, and are now, they should be doubly popular after the war."

Sir Eric Geddes, Deputy General Manager, North Eastern Railway, has now been made First Lord of the Admiralty. In May last the post of Controller of the Navy was specially revived for him by reason of his success in the reorganisation of the Army transport service. He was then given the temporary rank of vice-admiral. He is only 41 years of age.

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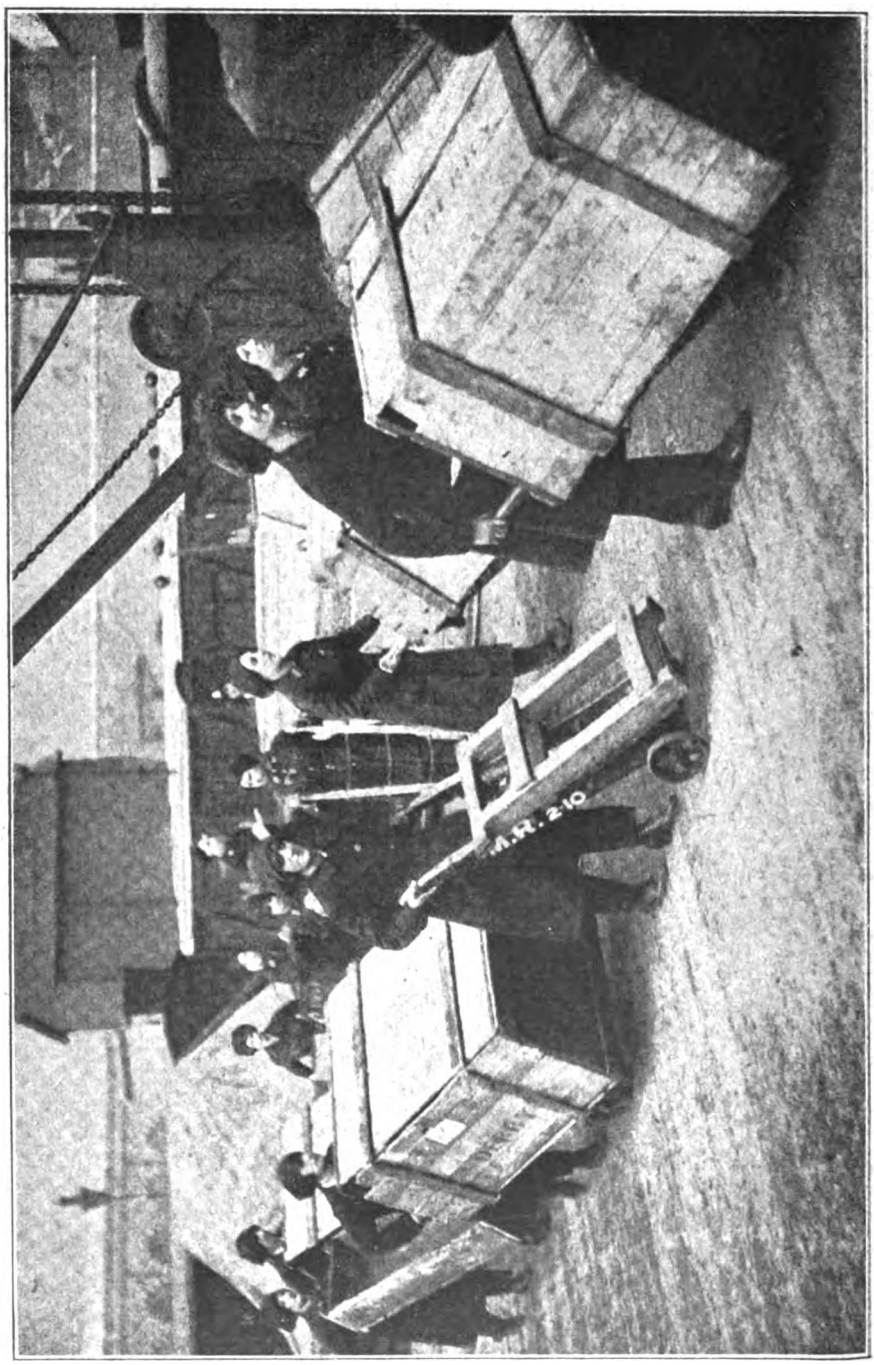

MIDLAND RAILWAY WOMEN WORKERS.
Transporting goods from wagons to street vans.

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One of the most remarkable developments in British railway war-time organisation and labour has been the recognition of the utility of women workers for replacing men who have left the railway service for military or naval purposes.

At the St. Pancras and Somers Town London goods stations of the Midland Railway there are several hundred women workers engaged in unloading heavily-loaded wagons and placing their contents on drays, or unloading traffic from drays for despatch by railway.

A development on so large a scale has only been possible after careful preparation. Sources of supply had first to be ascertained and appeals made for women workers. These met with a hearty response, and women from all walks in life presented themselves for "National Service," from whom it was not difficult to select a sufficient number of suitable applicants. As much of the work to be done was so entirely novel in character to the women, it was considered desirable that before they actually started work they should receive a certain amount of "schooling," and rooms were equipped as model stations to represent St. Pancras and Somers Town respectively. The goods to be handled were represented by address cards —"labels"—which took the place of addressed packages, and were used for the purpose of checking goods with the invoice or consignment notes. In order that the teaching should be thorough, "labels" were purposely made to disagree with invoices or consignment notes, and, in fact, provision was made for all the many discrepancies likely to arise in actual operations. The schooling proved so effective that in a very short time the workers were ready to commence the more arduous work awaiting them at St. Pancras and Somers Town.

One phase of the tuition was a thorough education in "Safety First" method. Each woman was given a printed circular on which the many ways accidents may arise were set forth, and this information was afterwards emphasised by lectures illustrated by photographs and diagrams. Theoretical work was then supplemented by practical instruction on the platforms of the stations where the women were to be allocated.

The uniform worn by the women consists of a long jacket and "trousers," which, although "unorthodox," is serviceable and very suitable for the work.

Fitted with modern appliances for heating and cooking food, mess-rooms, with proper attendants, have been provided, and there is in operation a system of "tickets" in the cloak-room, which prevents confusion and possible loss of clothes, to say nothing of temper.

"Supervision" has not been overlooked, and "matrons" have been engaged to look after the women, especially when in the cloak-rooms and mess-rooms. These "matrons" have been selected for their adaptability and general experience, which eminently fit them for their special work of assisting and looking after their charges, thereby contributing towards general efficiency. The supervisory work attendant upon technical operations on the platforms is entrusted to the foremen in charge.

By the courtesy of Mr. H. Evans, Chief Goods Manager, and Mr. J. Pepper, London Outdoor Goods Manager, the photographs on the accompanying pages were taken for *The Railway Gazette* by the Topical Press.

Recent Midland Railway military appointments include the following:—

Private A. C. F. Calladine, who before joining the Colours was acting inspector in the General Superintendent's department at Derby, has been made second lieutenant, Railway Operating Division, Royal Engineers. He formerly relieved periodically the stationmasters of most of the Peak of Derbyshire stations, and prior to his latest railway appointment was depôt master at Ashton Road, Manchester.

Sergeant H. Simpson, formerly station porter, Barrow-on-Soar, Leicestershire Regt., has been awarded the Military Medal for bravery in the field.

Captain J. W. Watkins, formerly clerk at Great Malvern, joined as a private in September, 1914, and has now been gazetted captain, to date from November 12th, 1916. He was mentioned in Sir Douglas Haig's despatches.

Corporal H. Reed, who enlisted from the Controller's department, Melton Mowbray, in May, 1915, and is now attached to the Signal Section, Royal Engineers, has received the Distinguished Conduct Medal for "general conduct of the year."

Corporal W. M. Pagram, previously a number-taker at Chesterfield, and now of the Gloucester Regt., has been awarded the Military Medal for bravery in the field. He joined the Army at the outbreak of war.

Sergeant E. Heathcote, station porter and porter-guard prior to enlistment in September, 1914, Cheshire Regt., Machine Gun Corps, has been awarded the Military Medal

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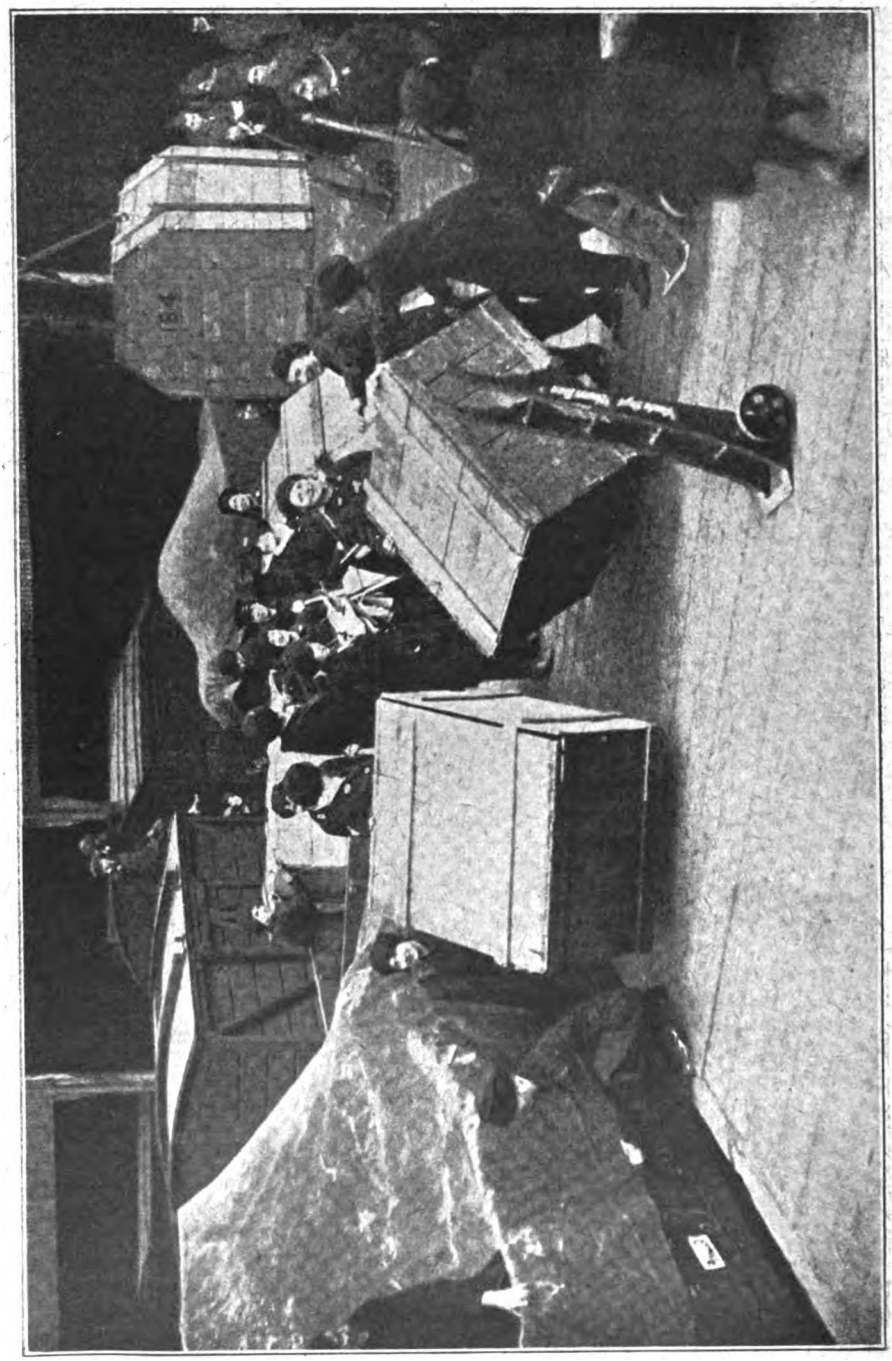

MIDLAND RAILWAY WOMEN WORKERS.
Unsheeting and unloading wagons.

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for good work performed in connection with an attack at Thriepval, when in charge of a machine gun section.

Lance-Corporal F. W. Hanson, Royal Warwicks, who in railway service was a parcel porter at Birmingham, has been awarded the Military Medal for conspicuous service in carrying on under difficulties.

Company-Sergeant-Major W. Jones, Durham Light Infantry, who was previously a porter at Long Preston, has been awarded the Military Medal for gallantry near Pozieres.

Company-Sergeant-Major J. T. Keene, Rifle Brigade, who was a passenger shunter at Normanton prior to enlisting in September, 1914, has been awarded a medal for meritorious service in the field.

Sergeant George Quartermaine, Northants Regt., who was a labourer in the motive-power section at Wellingboro', and had already been granted the Military Medal, has now been awarded the Distinguished Conduct Medal for leading a bombing party against the enemy dug-outs.

Great Western Railway directors, officers and staff have much reason for pride in the grand record for war service made by the men who have abandoned railway life at their country's call and for the admirable way in which the war-time traffic has been worked by those who are still in railway harness.

As to those who have joined the Army, the Divisional Engineer's Office, Neath, may be cited as a sample—or an example for that matter. Here the record is that fourteen members of the salaried staff—representing over 60 per cent. of the standard establishment—have joined. One member is a major; three others hold commissions, having risen from the ranks, two, at the time of writing, are undergoing training preparatory to taking up commissions, and four are non-commissioned officers. Lieutenant W. J. Bennett, R.F.A., one of the officers, has been mentioned in Sir Douglas Haig's despatches.

Still growing is the list of distinctions earned by members of the Great Western Railway staff on war service. The following being among the more notable recently announced:—

The Distinguished Service Order has been conferred upon Major George Herbert Spittle, R.E., late Royal Naval Division (assistant to the Great Western Railway Electrical Engineer, Paddington).

Captain Cyril Spencer Wilson, R.E. (assistant manager of the Great Western Railway Carriage and Wagon Works at Swindon) has been awarded the Military Cross.

Lieutenant Walter J. Cookson, R.E. (Solicitor's Office, Paddington), has been awarded the Military Cross and mentioned in despatches for the second time.

Sergeant W. Rotherham, formerly a porter at Acock's Green station, has been awarded the Military Medal for conspicuous bravery during an enemy bombardment, when he voluntarily went out repairing telephone wires under heavy shell fire. He also remained on duty in a house which was several times struck by the enemy's shell fire. Sergeant Rotherham has also been awarded the French "Croix de Guerre."

Sergeant W. T. Powell, King's Royal Rifles (waiter in the Great Western Railway restaurant at Birmingham (Snow Hill) station), has been awarded the Military Medal for good work done when a party of Rifles captured eight German officers and 40 men.

The Distinguished Conduct Medal has been awarded Private W. Jelfs, Worcester Regt. (a porter at Littleton and Badsey station).

Among the recent recipients of the Military Medal was Lance-Corporal John C. Humphrey, H.A.C. (Great Western Railway Solicitor's Office, Paddington), for conspicuous gallantry in an attack in which he was cut off and surrounded for four days and nights without food or water.

The Military Medal has been awarded Corporal D. Atlee, London Regt. (clerk in the Goods Department at Southall), for bravery displayed in a bombing raid, during which Corporal Atlee lost his right arm.

For holding a sap against three German attacks on the Somme, Private H. Evans (a shunter at Neath) was promoted in the field in France to the rank of sergeant, and awarded the Military Medal.

Lance-Corporal William Cole, Queen's Royal West Surrey Regt. (a fireman in the Locomotive and Carriage Department at Watlington, and formerly of Leamington), has been awarded the Military Medal.

The Military Medal has been awarded Sapper A. A. Hill, Royal Engineers (a fireman in the Locomotive Department at Southall).

Company-Sergeant-Major F. Greenaway, West Kent Regt., who was attached to the General Manager's Office, has been mentioned in despatches.

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Lieut.-Colonel J. G. Beharrell, D.S.O., has been placed at the disposal of the Board of Admiralty by the Army Council to act as Director of Statistics in the Controller's Department of the Admiralty. Colonel Beharrell is one of the several North Eastern railwaymen who have been "lent" by the company to the Government. He entered the North Eastern service in 1888 as a junior clerk in the Secretary's Office and at a comparatively early age was entrusted with important duties of a confidential character. Sir George Gibb happened to notice his ability and eagerness to obtain work of a responsible kind, and in 1902 gave him a post in the General Manager's Office. He had the advantage of three years' training under Sir George and then went to the Goods Department to undertake special work in connection with merchandise rates. In 1907 he was promoted to be one of the Assistants to the Chief Goods Manager, and in that capacity frequently represented the North Eastern Railway at meetings at the Railway Clearing House. In 1913 he was appointed Assistant Goods Manager. In 1915 he went with Sir Eric Geddes to the Ministry of Munitions and last year accompanied his chief to France as Assistant Director of Movements and Railways.

Photo] [Elliott & Fry.

LIEUT.-COLONEL J. G. BEHARRELL, D.S.O.
(North Eastern Railway).

Brigadier-General Gerald Edward Holland, C.B., C.M.G., C.I.E., D.S.O., R.E., Director of Inland Water Transport in France, and Marine Superintendent of the London and North Western Railway, has died, at the age of 57, whilst on active service. A native of Dublin, he joined the Royal Indian Marine in 1880, being promoted to Lieutenant in 1882. He served with the Burma Expeditionary Force in 1885–89 and with the Chin-Lushai Expedition in 1889–90, when he was mentioned in despatches and received the D.S.O. In 1893 he was made commander and was in charge of the Royal Indian Marine troopship *Warren Hastings* when that vessel was lost on Reunion Island in 1897. For this he was formally reprimanded but, simultaneously, received a commendatory order of warm praise from the Viceroy in Council. During the South African war he served on the Naval Transport staff as Divisional Officer, being three times mentioned in despatches and created C.I.E. Subsequently, he was, for three years, principal port officer at Rangoon, and, retiring from the Royal Indian Marine twelve years ago, he was appointed Marine Superintendent to the London and North Western Railway.

Whilst at Holyhead, he designed the *Rathmore* in 1908, the *Greenore* in 1912, a coal loading barge which avoids the manual coaling of ships, and the *Curraghmore*. The last-named is intended for the Greenore service, but has not yet been delivered. On the outbreak of war the deceased officer founded the Anglesey Royal Engineers—now commanded by his only son, Lieutenant Holland—and he went, subsequently, to France to take charge of the Inland Water Transport, with the rank of Colonel R.E. At the beginning of 1916 he was created C.M.G. and subsequently C.B., and was twice mentioned in despatches. He was made an Officer de l'Ordre de Leopold by the King of the Belgians, and an officer of the Order of St. Maurice and St. Lazarus by the King of Italy. Besides Mr. E. Tootal Broadbent (Director) there were many officers of the London and North Western Railway present at the funeral, including Mr. Guy Calthrop (now Controller of Coal Mines), Mr. I. T. Williams, Mr. James Bishop, Mr. M. C. Tait, Mr. Bowen Cooke, Mr. R. E. S. Cooper, Mr. L. W. Horne, Colonel Cortez Leigh, Mr. W. A. Jepson, Mr. C. Grasemann, Mr. G. Pike, Mr. S. B. Carter, Mr. H. Thompson, and Mr. A. T. Cotton, besides Mr. F. B. Griffith, the Assistant to the Marine Superintendent, and Mr. A. T. Orr, the Superintending Engineer.

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A Notable Railway Veteran.

MR. AMMON BEASLEY, GENERAL MANAGER, TAFF VALE RAILWAY, 1891—1917.

A LENGTHY and honourable career as a railway officer will terminate when Mr. A. Beasley shortly retires from the position of General Manager of the Taff Vale Railway, but he will be elected to a seat on the Board of Directors. He will be succeeded by Mr. E. A. Prosser, who is Joint Manager of the Cardiff and Rhymney Railways. Mr. Beasley became General Manager of the Taff Vale Railway in 1891, having previously been in the Great Western service for no less than 34 years. During the 60 years of his railway life, with the exception of the first year or two, when he was acquiring knowledge of station and other duties, he has been mainly concerned in administration and management.

MR. AMMON BEASLEY.

When Mr. Beasley joined the Taff Vale, the line was in unsatisfactory circumstances, and it was some years before it regained its position as one of the most prosperous railways in Great Britain. Its recovery from the position of 1891 was steady and continuous. Although confronted with the keen opposition of the Barry Railway and Docks, which has abstracted every year several million tons of coal from the Taff Vale route from colliery to port, its traffic has increased from about 11,000,000 tons to over 19,000,000 tons a year, while the passenger traffic has expanded enormously. In spite of being only 124 miles in length, the Taff Vale coal traffic exceeds that of any other railway in the United Kingdom with the exception of the North Eastern, Great Western, London and North Western, Midland, Great Central, and North British, and as only about one-half of the railway is coal-producing, as regards density of traffic, it is probably without parallel in the world.

Mr. Beasley has been a great champion of dock interests. He practically founded the Bristol Channel Dock Owners' Association, which was inaugurated in 1905, and has been continuously its President until now. During this period dock owners all over the country have reason to be grateful for the concessions secured for them by the vigorous policy of the Association. Just before the inauguration of the Association the Home Office desired to certify dock working as a dangerous occupation and to apply to docks certain factory regulations applicable to such trades. Mr. Beasley was the protagonist of the Bristol Channel Docks against these regulations, and successfully prevented the adoption of any which would have been dangerous and unworkable. He likewise took up vigorously the question of net tonnage. Dock-owners, under the Act of 1907, have the right to charge dues on a fixed minimum of net tonnage, whereas before that time there seemed to be no limit to the deductions which could be made from the gross tonnage for large, new, fast vessels.

Under Mr. Beasley's presidency, the Association has helped to secure for dock-owners the right to limit their liability for damage done to ships. It has further rendered yeoman service in redressing an inequality under which British ship-owners, as well as dock-owners, suffered in the matter of net tonnage, by securing that a British ship sold to a foreigner should not reduce its net tonnage below what it was when British owned. Again, Mr. Beasley has, since the war, obtained a great concession from the Government by contesting its claims for exemption from the payment of dock dues on goods and ships.

In railway affairs before Parliamentary Committees Mr. Beasley has always had a great reputation as a most redoubtable witness, and no one is better acquainted than he in all the intricacies of the disputes between the various railway and dock interests in South Wales.

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PERTINENT PARAGRAPHS

Our Colour Plate.

FRONTISPIECE of this month's RAILWAY MAGAZINE shows the 10.47 a.m. luncheon-car express from Norwich to Liverpool Street *viâ* Ely and Cambridge, Great Eastern Railway, emerging from the south tunnel at Audley End. This is one of the most picturesque stretches of line on the Great Eastern system, the striking design of the portals of the tunnel further enhancing the beauty of the scene as a "setting" for the photograph, which is the work of the RAILWAY MAGAZINE photographer, Mr. F. E. Mackay. The train represented is one of the heaviest running on the Great Eastern Railway, being booked daily to take on from Ely, after the attachment of the Hunstanton portion, a load of 55 axles, which is frequently exceeded at week-ends and other times of pressure. At this particular point the express is half-way up the long ascent of 17½ miles from Shelford up to Elsenham, and is just about to "rush" the short level and downhill stretch of 2 miles from Audley End to Newport before tackling the final climb to Elsenham. No. 1520, of the 4-6-0 superheater 1500 class, is the engine.

Shall a Railway Museum be formed?

ON this subject, as in most things mundane, opinions vary. From Bath Mr. L. B. Hewitt writes:—Is the present, or the immediate future the ideal time for forming a railway museum? With all deference to your correspondent, Mr. Harry T. Kerr, I think not. The very existence of such a periodical as the RAILWAY MAGAZINE supplies one cogent answer. The actual transition from contemporary to past history is practically momentary, and the successive volumes of this magazine provide a record of progress and development which should be amply sufficient, at all events for lay purposes.

A little consideration will disclose numerous obstacles. The consumption of metals for munitions is certain to enhance the value of scrap material; and railway companies cannot be expected to exhibit more sentiment than the ordinary private citizen. Who, for instance, would accumulate a collection of discarded bicycles? Again, many engines of comparatively recent date have been so altered (as on the Great Western Railway) by successive standardisation that but little of the original machines remains. At what precise point is the locomotive superintendent or his adviser to decide that a particular engine shall be sent to the museum instead of being modernised or scrapped? Are the Government funds to be further surcharged with the cost of purchasing discarded locomotives for exhibition purposes? Should railway nationalisation be forced on us after the war, the issue will be still further complicated. The State may have to purchase locomotives from itself for museum purposes. Then, as to the character of the exhibits. The lay enthusiast may be content with the "shell" only—perhaps even with examples of engines painted in a now discarded colour-scheme. But the practical engineer will expect to study novel or experimental systems of cylinder and valve-gear arrangement, or illustrations of the development of machine tools. If a Railway Museum is to be established, the originators should surely proceed along the lines of securing a collection of photographic illustrations and working models.

There is much to be said for the second suggestion embodied in Mr. Kerr's letter—that a species of locomotive "Roll of Honour" should be prepared. I am looking forward to the time when British railway companies will be enabled to publish a list of those locomotives which have been sent on foreign service. Would it not be practicable to prepare a distinguishing badge—uniform for all British railways—to be fixed to the locomotives thus selected? The simplest device would be the St. George's Cross on a white ground; but this might not prove sufficiently distinctive, or might be confused on some lines with a route indicator disc. Alternative suggestions are the Royal Arms or a trophy of Allies' flags in transfer, placed on the splashers, tanks, or cab-sides.

2-6-0 Locomotives on British Railways.

To supplement the paragraph concerning our July frontispiece and the history of the building of modern 2-6-0 locomotives on British railways, Mr. Hewitt directs attention to the large class of 2-6-0 mineral engines on the Great Western Railway. These engines have inside cylinders and outside bearings to the coupled wheels, which are 4 ft. 6 in. in diameter. The class, numbered from 2600 onwards, consists of over 70 engines. Officially the engines are often referred to as the "Aberdares." No. 33, the first of the type (now No. 2600), was illustrated in the RAILWAY MAGAZINE for July, 1901, as a frontispiece colour plate. These engines are very strictly confined to goods and mineral working, and are rarely seen on passenger trains. They were introduced with the present century.

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"All-Green" Modern Locomotives.

At last the expected has happened, writes our Bath correspondent, and examples of the "all-green" modern locomotives are to be seen on the Great Western Railway. A 4-6-0 four-cylinder locomotive appeared in June in an entirely green livery, with the brass safety-valve casing painted over. For a long time the brass-work on the boilers of the older engines with domed boilers has been hidden by paint. Now other engines with the tapered boiler have been similarly treated. Later examples include the 4-4-0 and 2-6-0 (outside cylinder) types. The practice will probably be generally adopted.

Railways in Mesopotamia.

The extent to which the transport troubles in Mesopotamia have been overcome by the conversion and establishment of railways has not escaped notice. The military correspondent of *The Times*, in dealing with the official report on the campaign, remarks that the establishment of the Army at Baghdad and at certain advanced positions on both rivers closed the active campaign of the season, "but much remained to be done on the now extended line of communications. The river transport steadily improved, thanks to the arrival of new ships and barges. By the middle of April the Kurna-Amara Railway was converted to metre gauge, which was already that of the Basra-Nasariyeh line. A certain line, no longer required, was rolled up and brought to Baghdad, where it should prove most useful, and the establishment of a metre gauge line from Kut to Baghdad was taken in hand. Thanks to all these improvements, and to the invaluable help of Sir John Cowan's Department in London, the Army found itself admirably provided, and the medical arrangements became at last thoroughly satisfactory. All now rested on the continuance of sound direction and upon keeping things up to the mark during the hot weather, a task of no little difficulty, but not beyond the power of the new spirit which prevailed. The Army had reached a land of plenty in comparison with the barren deserts to which it had been accustomed. Large supplies of fresh meat, vegetables, fuel, grain, and fodder were available in the area now controlled, and as Sir Stanley Maude has created a Local Resources Directorate which will cover all Mesopotamia and tap every area to the utmost, the Army will be able to live to some extent on the country, while the transport up-river of many bulky articles will be reduced to a minimum."

British Railways after the War.

Sir Herbert Walker, the General Manager of the London and South Western Railway and Acting-Chairman of the Railway Executive Committee, expects to see many important changes take place after the war with respect to the methods of railway working and also with regard to their relations with each other and their relations with the general public. In the course of a recent interview accorded to the representative of a London weekly newspaper, Sir Herbert said:—

"I cannot think that our railways will ever revert to the independent and foolish competitive system which obtained before this war broke out. The old system possesses manifold evils, not the least being the wastefulness of competition, often for no real worthy purpose; the lack of standardisation; the thousand and one intricate and time-engaging processes necessary on each line owing to rivalry with others in ways that never ought to have been allowed. If we are to get the really useful and tangible result of what has been done in the war—if we are to prove that the experience gained has been beneficial—there must be vastly more co-ordination between the various lines and companies. Overlapping must cease, and waste of material, stock, man-power, and energy must be done away with."

"How can this be brought about?"

"That problem should be tackled at once. Whether the result would best come from the nationalisation of the railways, from general control, such as in force to-day, or from a pooling of their stocks, resources, and incomes, cannot now be determined. It is not even advisable to indicate which plan might be found most useful and profitable to all concerned."

"What about railway fares after the war?"

"You may safely say that fares will revert to their old rates as soon as practicable for ordinary passenger traffic, but it is doubtful whether the railways will reintroduce the very cheap day and half-day trips to the seaside and inland towns at the abnormally low rates which were in vogue before the war."

"Then railway revenue may show a falling-off for a long period after the war ends?"

"No, I don't think that need follow. It is true that, with the big losses in our population from people killed or severely incapacitated by wounds, from reduced incomes, from a lowered birth-rate, and so on, there may not actually be so many people to travel; but, on the other hand, there will be a large increase in the number of people travelling for business purposes, and in particular the goods traffic is likely to grow, because of the opening-up and working of fresh industries which the war will have brought into the foreground—sources of income to the railway companies which before the war either did not exist at all or were tapped very inadequately, but which are now becoming available."

"Will the conditions of travelling change?"

"How much more can travellers want or have? Already on all long-distance trains they have enjoyed pleasant corridor carriages, with dining-cars, lavatories, and smoking compartments. That touches the point as to whether we shall in time have but one class of carriage for all sorts and classes of travellers. In theory such a system is excellent, but in practice it prevails nowhere in the world. People will quote the United States and other countries to you as examples of such equality, but in reality their suggestion is not a truthful one. For in the United States—and elsewhere—the man who

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can afford to do so takes a seat in the Pullman car and thus gets accommodation that he who cannot pay for does not get; hence he, in deed and truth, becomes what we term here a 'first-class' passenger. Every land has some similar distinction. So that probably we shall not find the English first-class merge for a long time into the third-class, but that travelling in general will tend to be easier and more comfortable I have no doubt."

"Then you think that our railway system will show great improvements as the result of the experience and tests it has gone through?"

"Unquestionably! Of that there is no doubt whatever!"

Coal Control.

In his Governmental position as Controller of Coal Mines, the London and North Western Railway General Manager, Mr. Guy Calthrop, has produced his scheme whereby an enormous amount of railway mileage is to be saved in the haulage of coal and in the return from unloading points to the collieries of the empty wagons.

It is estimated the scheme in operation will effect a saving of no less than 700 million ton miles annually in the transport of coal by public railway. In other words, it will set free in one year transport capable of carrying 7,000,000 tons for 100 miles, while assuring to consumers of coal the continued fulfilment of their requirements.

By Mr. Guy Calthrop Great Britain has been divided into twenty areas, sixteen in England and Wales and four in Scotland, and directions have been issued to regulate the transport of coal from any one of these areas to purchasers in other areas, as from September 10th, 1917.

At the present time the output of coal-producing areas is, in many cases, very widely distributed, without much regard to distance or to railway facilities; the coal required for consumption in many areas is drawn from numerous sources, some of them at a great distance. Producing areas do not send away merely the surplus of their production over their requirements, but frequently despatch so much to distant localities that they are themselves obliged to make large purchases in other areas. The result is a multiplication of long-distance and cross-country journeys which throw a heavy strain upon the depleted railway staffs and rolling stock, and involve serious stoppages at the collieries, due to delays in the return of empty wagons.

Basis of the Scheme.

The Coal Transport Reorganisation Scheme, which has been framed to remedy these evils, has been based on four main principles:—

(1) That consumption of coal should take place as near the producing point as possible.

(2) That in view of the superior facilities afforded by the main trunk lines, the movement of traffic should follow these routes wherever possible.

(3) That the movement of coal should, as far as possible, be in well-defined directions, viz.: North to South; North to South-East; North to South-West; East to West.

(4) That an area producing less coal than suffices for its own needs should not, unless some good reason exists, send any portion of its output to other areas; and That an area producing more coal than it requires for consumption within the area itself should only distribute the balance to adjacent or convenient areas.

For the purpose of giving effect to these principles, a table has been drawn up showing the areas to which coal for steam and manufacturing purposes, gas and coking, and household use respectively, may be forwarded by public railway from each of the producing areas. As from 6 p.m. on Saturday, September 8th, all existing contracts for the sale of coal which involve its transport from the producing area to a locality in any area other than those permitted by the directions will be cancelled.

For the information of those affected, maps showing the areas into which England and Wales, and Scotland, respectively, have been divided, have been prepared by the Railway Clearing House. Copies of these maps, together with a diagram illustrating the effect of the scheme on the exchange of coal between the areas and a pamphlet embodying full instructions, may be obtained, post free, by all concerned, either as colliery owners, factors, merchants, or direct consumers, on application to the Secretary, Railway Clearing House, 123, Seymour Street, London, N.W.1, marking the envelope Box 1.

Proposed Goods Clearing House Scheme.

As reported in another section of this magazine, the adjourned discussion on Mr. Roy Horniman's paper entitled "The Great Railway Tragedy" has been held at the Railway Club, in the presence of a good attendance of members, and one of them, a leading writer on railway subjects, has furnished the following comments: Although the boldness of the conception of the Central Goods Clearing House for London and exceptional ingenuity embodied in the various features of its design were freely admitted, the criticisms raised by all the speakers, several of whom are men with practical railway experience, was decidedly adverse. The discussion on the night on which the paper was read revolved mainly round the alleged need for change in our methods of handling goods, but the adjourned discussion dealt almost exclusively with practical objections to the New Transport Company's scheme. Among these may be mentioned the under-estimation of the initial cost of the Clearing House scheme, not only as regards the enormously enhanced price of materials and labour in the building and equipment of the Clearing House itself and its approach tubes, but also in connection with

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the conversion of vast quantities of wagons into vehicles of the "container" pattern or the construction of new rolling stock, the electrification of the lines of the connecting railway companies from the points of junction with the Clearing House tubes to points suitable for the attachment of the steam locomotives, and the enormous legal expenses that are bound to arise, all of which should properly be charges on the company erecting and operating the Clearing House. Other objections raised concerned the impracticability of working heavy and continuous goods traffic over such congested passenger lines as the Metropolitan between Paddington and King's Cross or the Great Eastern between Bethnal Green and Bishopsgate: the impossibility of certain of the physical junctions proposed; the futility of attempting to work goods traffic on a large scale to a time-table such as that given in Mr. Horniman's book, with such short intervals between trains and between arrivals and departures, making no allowance for failures or delays on the main lines and with no facilities whatever at the Clearing House for refuging trains when necessary; the difficulty of the small trader, and so on. It was agreed that the remedy to such evils as at present exist in London cartage arrangements might be largely met by closer inter-working between the various railway companies, on the lines of the Great Northern-Great Central-Great Eastern agreement, whereby unnecessary depôts might be closed and overlapping avoided.

An American Railway Monthly.

AMONG the many railway periodicals that have come into existence during the past decade or two, is the *Baltimore and Ohio Employees Magazine*. This is published monthly at Baltimore, Maryland, U.S.A., by the employees of the Baltimore and Ohio Railroad to promote community of interest and greater efficiency. There is nothing exactly like it published in Great Britain, but it approaches the *London and North Western Railway Gazette* somewhat closely in the amount of space devoted to affairs connected with the sports, pastimes and amusements of the staff off duty.

The serious and business side of railway life and work receives a due share of attention. Such matters as the care of a typewriter, the cost of raw material used by the railroad, and the prevention of claims are sandwiched between articles concerning the baseball league and the cost of living. A quantity of sound advice is printed in this periodical, as will be seen by the following paragraph:—

Get Out on Line.

A YOUNG man who had been in the service of the Company for five years and had done his work well, felt that he was getting into a rut. He was sensible enough to see that when his viewpoint was not enlarging as the years crept by, his chances for advancement were not opening up either. So he went to an official, told him his story and asked him what to do.

"Get out on line," replied the official. "There are lots of young fellows on the system who are in the same situation that you are. But the hopeful thing about your case as compared to theirs is that you realise that you are in trouble when most of them do not.

"Get out on line. That is what I tell all my clerks who seem to be getting stale. Ride the trains, learn how the signals are operated, use your holidays to visit the big terminals and the big yards. Find out about the motive power, why this type of engine is used here and the other type there. Talk to the operating men, ride the rear end whenever you can, get the viewpoint of the man in the caboose. Find out what he thinks about safety. Then see the trackmen and spend a couple of hours with a section gang. Some of the wisest men on our big system are the section foremen and supervisors. And they are usually glad to talk to a young man who is seeking information.

"If I were in your position that is the course I would follow. It will sharpen your wits by putting you in contact with the other man who is helping run the big machine. It may give you an idea of some special kind of railroad work for which you are peculiarly adapted. If it does you can go ahead twice as fast as you have in the last few years."

This advice, coming from an eminently successful man who has had experience in practically every kind of railroad work, is worthy of careful consideration.

The "Railway Magazine" for Neutral Readers.

IN response to a number of enquiries we have to say that the announcement made in the RAILWAY MAGAZINE, August, 1916, still stands. Owing to Censorship regulations British magazines can only be posted to neutral countries in Europe and America by those holding special permits. Now the United States of America are no longer neutral, printed matter may be mailed to addresses there by private persons but it saves great delay and work in Censor's Department if sent direct from the publisher possessing a permit. The Railway Publishing Company, Ltd., holds a permit to post the RAILWAY MAGAZINE and copies will be sent by the Manager on the following terms:—To neutral countries (by ordinary post) 8½d. per copy, or 8s. 6d. per annum. Remittances should be sent to THE RAILWAY MAGAZINE, 30, Fetter Lane, Fleet Street, London, E.C.4.

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WHAT THE RAILWAYS ARE DOING

FROM the Rev. J. B. Baron Collins, who is well known to most RAILWAY MAGAZINE readers as an authority on the history of railways in Cornwall and Devonshire, comes the following note:—"In the 'sixties' of the 19th century a continuation of the Liskeard-Caradon mineral line towards the *north* coast was begun and some three miles of cuttings and embankments made, which are now crossed by substantial granite hedges. The idea was to shorten the sea passage from Looe by using a small port on the other side of the peninsula, but the decline of the mines and the lack of money soon stopped the work. The country near the north coast would not be easy for a railway, nor are there any good ports on that side of Cornwall. There are abandoned extensions east of this proposed line, on the high ground of Sharp point tor and Kilmar, from which tor the three miles of railway can be seen across the valley. The line ends in a cutting near Dozmary Pool, a small lake. It would have opened up much of the Bodmin Moor, had this line been completed and used, though the population and resources were scanty. There is the possibility of china clay to make the southern end of this line as far as Altarnun worth consideration when peace comes and money gets easier."

* * *

YET another visit has been paid by the Orchestra of the Great Eastern Railway Musical Society to the Woodcote Park Convalescent Camp, Epsom, when notwithstanding the outdoor attraction of a fine evening the large recreation hall was again packed to overflowing; such is the interest which the society creates. Colonel Galloway, the honorary conductor, as usual, early established that feeling of fraternity between the audience and the performers which has so largely contributed to the success of the concerts which the society has given.

* * *

MR. THOMAS ARMSTRONG, on his retirement from the office of Goods Superintendent at Belfast, of the Great Northern Railway (Ireland), has been the recipient of a presentation from the officers and staff. It took the form of a substantial cheque, with a wristlet watch for Mrs. Armstrong. Mr. B. Gamble, the Goods Manager, who presided, spoke of Mr. Armstrong's long service as Superintendent at Belfast, and said that, whilst he had given satisfaction to traders, he had never neglected the interests of the company and its employees. Several other officials, including representatives of the Dublin offices, spoke of Mr. Armstrong's excellent qualities, after which Mr. M'Adoo, General Manager of the Cavan and Leitrim Railway, made the presentation. Mr. Armstrong, in replying, said that he had had 45 years of strenuous railway service, and as a new administrative system was being introduced in the working of the Belfast goods department he had decided to accept the generous terms offered by the Board.

* * *

MR. J. E. WILLIAMS, who in December last resigned the general secretaryship of the National Union of Railwaymen on account of ill-health, has recently died. Born at Bristol 61 years ago, he entered the service of the Great Western Railway as a lad, and there remained about 30 years. While acting as goods guard he lost a leg and part of his hand as the result of an accident. For over 40 years he was connected with the Railwaymen's Union in various capacities. He was appointed General Secretary in 1910 on the retirement of Mr. Richard Bell, and when the society became the National Union of Railwaymen he retained the position. He served on the Advisory Council of Labour, and was a member of the Parliamentary Committee of the Trade Union Congress. In 1916 he visited Canada as a delegate from the British Trade Unions to the American Congress of Labour.

* * *

MR. EDWIN HOOPER RUSSELL, stationmaster at Hellifield, Midland Railway, has been appointed stationmaster at Chesterfield. He entered the service in 1876 at Salford Priors, and after being at Defford, Eckington (Worcestershire), and Kentish Town, was in 1896 promoted to the superintendent's office, Derby, as passenger train inspector. In 1902 he was transferred to the district passenger superintendent's department, St. Pancras, and in 1905 became stationmaster at Hellifield.

* * *

MR. WILLIAM HENRY HUFF, station inspector, general superintendent's department, Derby, has been appointed stationmaster at Hellifield, in succession to Mr. Russell. He entered the service in 1883 at Newark, and afterwards went to Burton, Kentish Town, Liverpool, Derby, Liverpool again, Leeds, and Burton again. He returned to Derby in 1903 as platform foreman, was made inspector in 1907 and station inspector in 1912.

* * *

RECENT railway obituary includes Mr. Henry H. Powell, Chief Accountant to the Barry

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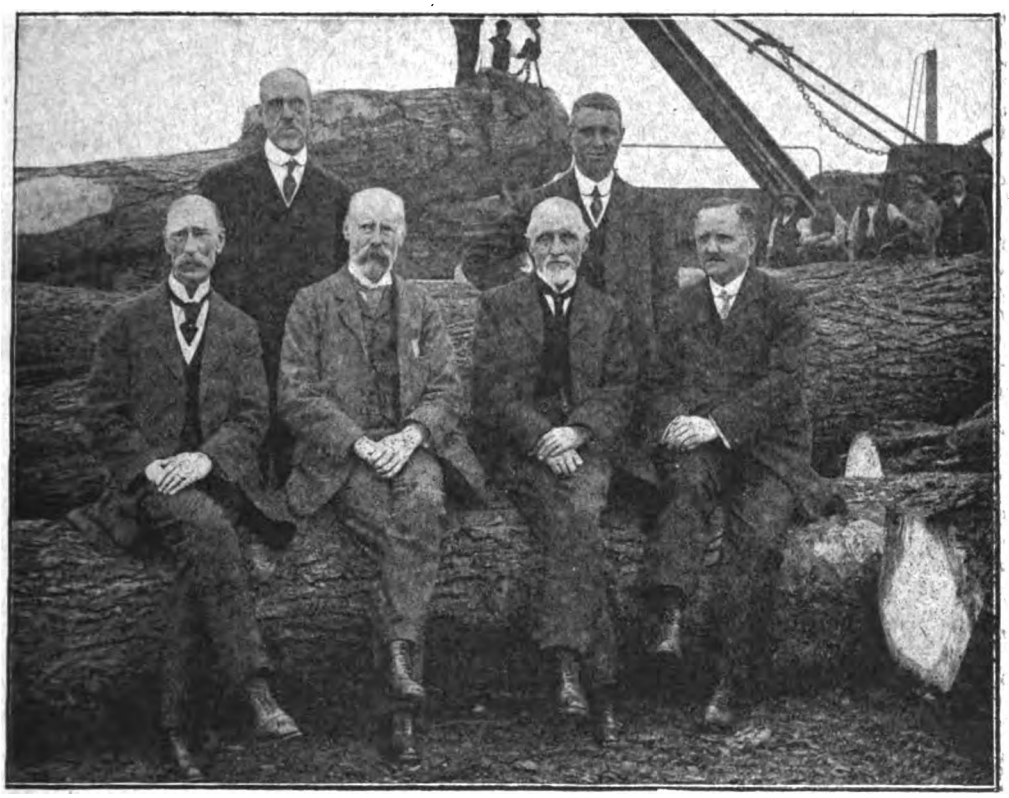

LONDON AND SOUTH WESTERN RAILWAY DISTRICT GOODS SUPERINTENDENTS.

Photograph taken at a recent Timber Loading Conference at Basingstoke.
From left to right. Standing: Messrs. H. Spurgeon (Reading), W. R. Venton (Southampton).
Sitting: Messrs. J. F. Woodbridge (Devonport), C. Turner (Salisbury), H. Venton (Exeter), and F. S. Bridge (London).

Railway. He had been in the service for many years and was about 50 years of age.

* * *

THE death has taken place of Mr. Francis B. Ormsby, J.P., who retired from the position of Secretary to the Great Southern and Western Railway in June, 1909, after a tenure of that office lasting 29½ years. Born at St. Peter's Vicarage, Drogheda, in 1849, he was educated at Carlisle Grammar School. He was appointed Secretary of the Great Southern and Western Railway in 1880, not having had previous railway experience.

* * *

IN connection with the recent royal visit to the Grand Fleet, a letter has been received from Buckingham Palace by Mr. Thomas McEwen, Traffic Manager of the Highland Railway:—

"Dear Mr. McEwen,—The King desires me to express to you his thanks for the care and trouble which was taken in the matter of arrangements during the time that His Majesty spent on the Highland Railway. The King commands me to forward you the accompanying souvenir of His Majesty's recent journey in the Highlands.—Yours truly,

"(Signed) CROMER."

The souvenir is a beautiful diamond scarfpin with His Majesty's monogram surmounted by a crown. Mr. McEwen has personally been in charge of all the Royal trains run over the Highland Railway since 1902, in which year the late King Edward and Queen Alexandra visited Dunrobin Castle. On that occasion Mr. McEwen had the honour of being included in the Royal party at luncheon in the Castle.

* * *

AT headquarters, 92, Victoria Street, London, S.W., the Railway Club held the July meeting on the 10th ult., and the ordinary business transacted included the election of a new member. This meeting, arranged at the request of the lecturer at the preceding meeting, was the adjourned discussion on the Paper by Mr. Roy Horniman entitled "The Great Railway Tragedy." The speaker at the June meeting claimed that by the adoption of the New Transport Co.'s scheme of a Central Goods Clearing House, many, if not all, the problems confronting

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the railways would be solved. However, this gentleman, and his friend Mr. Gattie (who was present in June) failed to appear. Despite their absence the various speakers presented an interesting view of their opinions, the majority of which were not favourable to the proposed scheme, on the point of cost, desirability and practical adaptation.

* * *

WHERE are locomotives Nos. 400 (4–6–0) and 341 (4–4–0) on the Great Southern and Western Railway shedded and what trains are they now working? A London reader, Mr. T. A. Corbett, will be greatly obliged if an Irish reader will pass him this information through the medium of the RAILWAY MAGAZINE.

* * *

IN connection with Mr. E. L. Ahrons' historical article on South Eastern Railway engines Mr. H. L. Hopwood recalls the fact that 7 ft. single locomotive No. 199 was involved in the Staplehurst accident on June 9th, 1865. Charles Dickens was a passenger in the train and it is a coincidence that he died exactly five years later on June 9th, 1870.

* * *

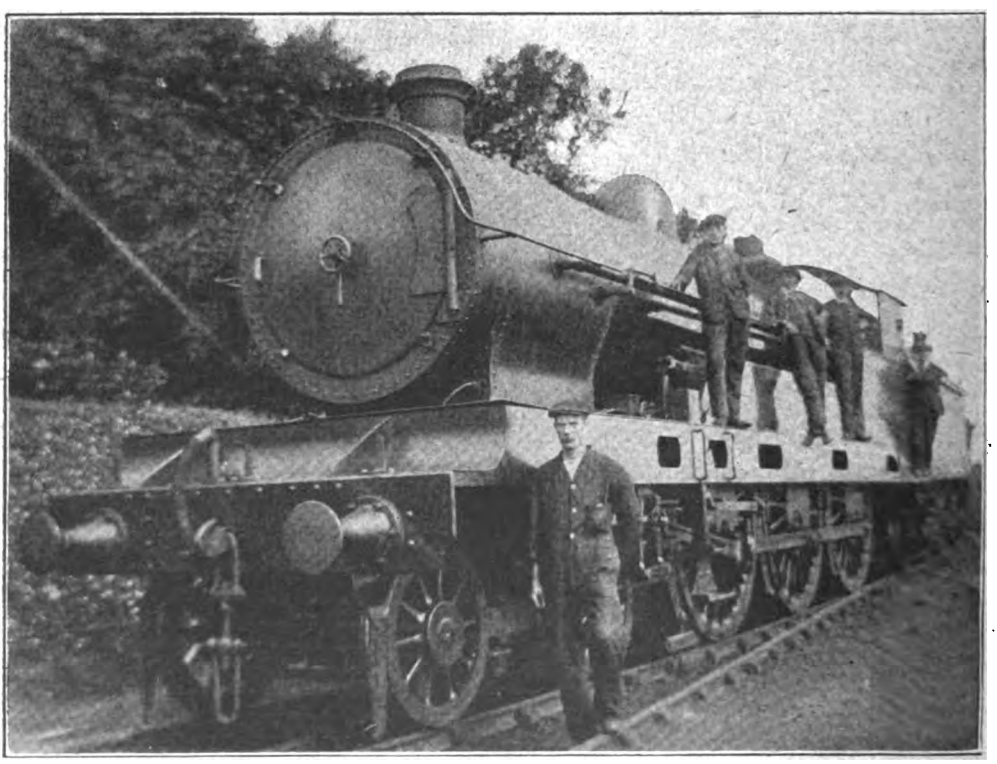
IF any RAILWAY MAGAZINE readers can advance the information Mr. E. Hope Winstanley, would appreciate replies to the two following questions:—"Do any of the old "Ventnor" and "Shanklin" class singles of Stroudley's still survive and remain on active service? Are there still working on the Highland Railway in the Perth to Aviemore section any 0–4–0 tanks?"

* * *

"NORTH BRITISHER" writes:—"On page 55 of July RAILWAY MAGAZINE is a photograph of a North British six-coupled goods engine No. 1200. I should be obliged if any reader could give me any information concerning these old North British Railway engines, their numbers, dates, makers, etc." He then adds:—"It may interest your numerous readers to know that Mr. Reid has rebuilt several of the 2–4–0 locomotives designed by Mr. Thomas Wheatly and known as the 418 class. As rebuilt they have large cabs with side windows and are numbered 1239–40, 1245–49. Many of the Drummond and Holmes 4–4–0 engines have been rebuilt by the present locomotive superintendent."

* * *

J. N. F., of Bristol (and many other readers), may like to be reminded that No. 1311, Great Western Railway, the 0–6–0 saddle tank to which he referred on page 69 of the July issue, was illustrated in Volume IV. of the RAILWAY MAGAZINE (January to June, 1899). This engine was one of three owned by the Liskeard and Carndon Railway, a Cornish line



LONDON AND NORTH WESTERN RAILWAY.

"Claughton" Class locomotive, No. 1191, *Sir Frank Ree*, under repair at Bletchley.

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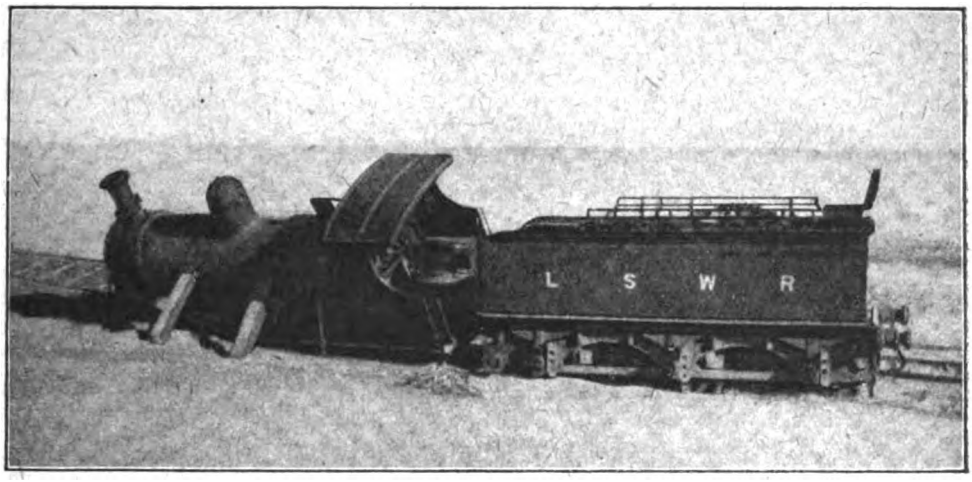

A LONG WAY FROM EASTLEIGH.

London and South Western Railway Engine on War Service; derailed in the Sinai Desert. Derailment was caused by sand drifting on to the line.

some 14 miles in length, connecting Liskeard with Looe, and originally worked by an independent company. In the issue for April, 1899, this railway was described by Mr. F. Goodman, of the Superintendent's Department, Great Northern Railway. "Cheesewring" is taken from a pile of granite slabs, presumably prehistoric in origin, near the railway. Mr. Goodman's article of 18 years ago hinted at the forthcoming acquisition of this line by the Great Western Railway.

* * *

AN improvement on the Great Northern Railway (Ireland) 6.30 p.m. Belfast express from Amiens Street station, Dublin, has been inaugurated. It is now booked to Drogheda (slip coach) in 36 min. for the 32 miles, and Dundalk in 63.

* * *

IN reply to Mr. J. Pritchett's question in the July RAILWAY MAGAZINE, Mr. S. T. T. Geary states that the London and North Western Railway locomotive *Thunderer* is now stationed at 34 Shed, Patricroft, and is chiefly engaged on local passenger work. On June 13th he saw this engine leave Exchange station, Manchester, with the 3.40 p.m. to Chester, returning the same night about 10.0 p.m. It is frequently, he adds, to be seen at Liverpool, or if working goods or special working, may be seen further afield. Prior to being stabled at 34 Shed, it was at Camden (1) and very regularly worked the 5.30 a.m. *ex*-Euston–Crewe empty stock, returning from Crewe with the 12.5 a.m. up Holyhead parcel train. A later letter from Mr. Jas. R. Whitaker, Old Colwyn, states that *Thunderer* is working the down express from Manchester, due Old Colwyn 1.36 p.m.

* * *

A KEEN observer of locomotive movements on the North British Railway is Mr. W. D. M. Stephen, of Inverkeithing. In a recent communication to the RAILWAY MAGAZINE he says: "Since my last letter the North British Railway have re-built another of the 'Atlantic' class, No. 881, *Borderer*, with a new boiler, Robinson superheater, and enlarged cylinders 21 in. by 28 in. Five more locomotives of the 'Glen' (4–4–0) class, similar to those built in 1913 (see RAILWAY MAGAZINE, Vol. XXXIII., pages 263 and 439), fitted with the Robinson superheater, have just been built at Cowlairs. Their names and numbers are: 291, *Glen Quoich*; 298, *Glen Shiel*; 100, *Glen Dochart*; 153, *Glen Fruin*; 241, *Glen Ogle*. There are now 20 of the 0–6–0 superheater goods class in service, all built at Cowlairs. (See RAILWAY MAGAZINE, Vol. XXXIX., page 157.) Their numbers are 8, 13, 44, 62 and 113, built in 1914, Nos. 136, 222, 255, 260, 261, 263 and 429-432, built 1915, 433-437, built in 1916. There are now 76 superheater locomotives in service on the North British Railway, which consist of: 4 locomotives 4–4–2 class re-built, 22 4–4–0 'Scott' class, 15 4–4–0 'Glen' class, 20 0–6–0 goods class, 15 4–4–2 tanks. The majority of these engines have the Robinson type of superheater, but a few are fitted with the Schmidt apparatus. All these engines have Wakefield's standard eight-feed mechanical lubricator and the later engines of the 'Glen' class are furnished with the anti-carboniser, as described in the July RAILWAY MAGAZINE."

* * *

AN Ayrshire RAILWAY MAGAZINE reader, Mr. David Smith, writes:—"I have read with much interest Mr. Niven's paragraphs on the Glasgow and South Western and kindred railways. Perhaps I can supplement them with my own information. No. 71A emerged from the shops about December, 1916, all newly done up, and I had a short run on her, when, in spite of an easy schedule, she did well. Her regular run,

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I believe, is with the 2.25 p.m. workmen's train to Cronberry (near Muirkirk), thence to Irvine, and back to Ayr. She sometimes pilots the 9.10 a.m. goods to Girvan. The men have a good word of her, but say she is rather light. Some new 0–6–2 tanks are being turned out, similar to those built in 1915. The 1915 ones are: 45, 84, 90, 91, 122 and 284. Those now out are numbered 99, 100, 101, 102, 142, 143, 145, 147 and more to follow. Thus No. 100, mentioned by Mr. Niven, becomes 100A. Her predecessor, old No. 100A (P. Stirling 0–6–0) was known at Ayr as the 'Old Hundred.' There are also to be three six-coupled tanks for shunting at Greenock Harbour, these to have flangeless drivers and outside cylinders. The tanks, in this part of the country, are known as 'pugs,' even Mr. Pickersgill's new 4–6–2's on the Caledonian being called thus. A tender engine is an 'engine,' but a tank engine is just a 'pug.' Engines are used very promiscuously on the Glasgow and South Western Railway. Thus Manson's 4–4–0's (No. 8 class) are often to be seen piloting mineral trains in the neighbourhood of Ayr. The climax was reached when I observed No. 132, Drummond 4–4–0 express, with a train of empty mineral wagons for Waterside! The 4–6–0's are also working on munitions specials, etc."

* * *

"With regard to the Smellie 0–6–0, No. 84A," continues Mr. Smith, "she was originally fitted with a hydraulic brake, which was so sudden in its action that she parted couplings in great profusion when shunting. So Glasgow, where she was at first, sent her to Hurlford, and she was successively at Dumfries, Carlisle, Stranraer and Ayr. Ayr could work her, and has kept her since. She now has the ordinary steam brake. The engine owned by the Dalmellington Iron Company, mentioned by Mr. Niven, is a 2–4–0 well tank, with 4 ft. 6 in. wheels (driving) and Salter's valves on the dome. Her eccentrics and link motion are all outside, this form being known as 'Davies's valve gear.' The water supply is carried in two tanks, one under the footplate and one forward of the driving axle, between the cylinders, which are outside. She was built in 1866 by R. Hawthorn, of Leith, and bought in 1872 by the Dalmellington Iron Company, after having lain in stock for six years, to work their Coylton branch, which necessitates a journey of nine miles over the Dalmellington branch. The Glasgow and South Western had refused to allow a four-wheeled engine to proceed over their line. For coal, she pulls behind her a four-wheeled wagon. I believe she was intended for passenger work and that some of the engines of this type worked in the North of Scotland as such many years ago. She is numbered 10 in the Iron Company's stock and known to all as 'Nanny.'"

* * *

"Do any Railway Magazine readers remember the Midland Railway engines of Mr. S. W. Johnson's 4–4–0 type?" asks Mr. Malcolm M. Niven, who continues: "They had 7 ft. coupled driving wheels, 3 ft. 6 in. bogie wheels, and had 18 in. by 26 in. cylinders and 1,260 sq. ft. of heating surface. I think these engines came out about the early 'eighties'; at any rate, Dübs & Co. built some of them: they had domes, Adams' safety valves. They were very handsome machines. Their numbers were 1330 odd. I have a print of 1336. They had the appearance of Mr. James Manson's early No. 8 class, Glasgow and South Western bogies, only Mr. Manson's have 6 ft. 9 in. wheels as compared to the Johnson 7 ft. wheels. They ran on 28 lbs. of coal per mile; the bogie was Adams' patent type. Steam brakes were fitted to engine and tender when they came out."

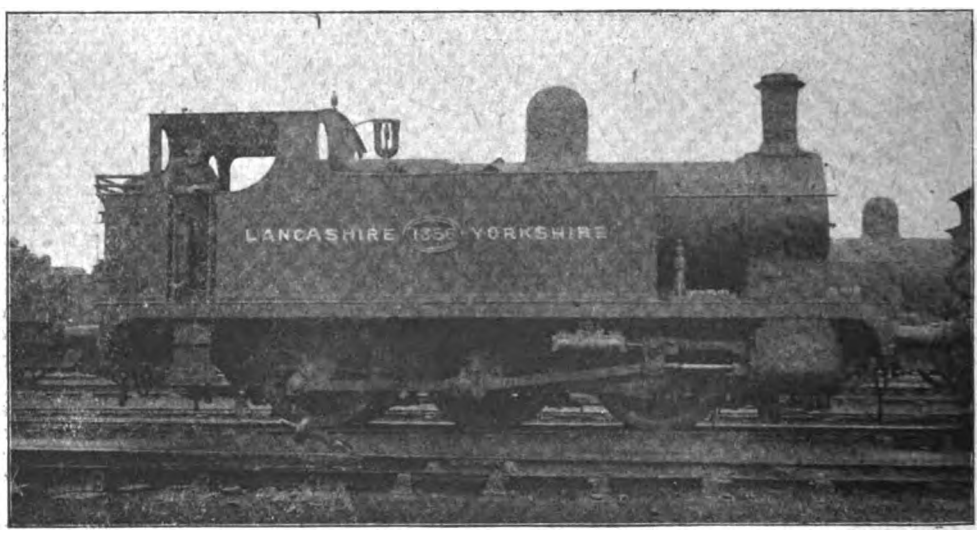

Photo [*W. H. Whitworth.*

LANCASHIRE AND YORKSHIRE RAILWAY.
0-6-0 Tank Shunting Engine, No. 1356.

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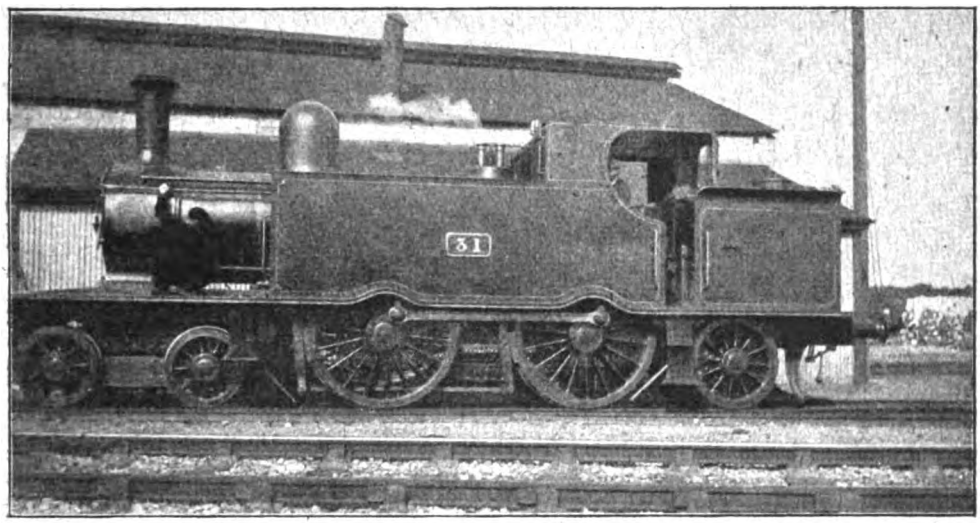

Photo] [*T. Grove White.*

GREAT SOUTHERN AND WESTERN RAILWAY.
4-4-2 Tank Engine, used for shunting at Mallow.

In his report on the collision which occurred at Queensferry Junction, North British Railway, in January last, when twelve persons were killed and forty-eight more or less seriously injured, Colonel Pringle, of the Board of Trade writes: "The suitability of the lay-out in Queensferry Junction yard for traffic work evidently requires thought and consideration. Either some rearrangement of the loop lines and sidings is called for, in order to avoid the necessity for light engines having to round their trains over the main line crossover, or adequate protection in the way of signals, and possibly trap-points, must be provided. I understand the Company have this matter under consideration, and they will no doubt report the decision they arrive at. I cannot help thinking that the policy of appointing spare signalmen as traffic inspectors in the districts in which they have long been serving, as was done in Inspector Urquhart's case, is open to criticism. The circumstances show that, as inspectors, they are unlikely to recognise, as dangerous or irregular, methods of working which, as signalmen, they have long approved and adopted, and they cannot therefore be expected to draw attention to or check such practices. The last point to which I wish to draw attention is one to which previous reference has been made in other reports—that is, the liability to danger in dealing with light engine traffic. This case, with its very deplorable results in loss of life and injury, is illustrative especially of danger from light engine traffic in connection with rounding work. I suggest, for the consideration of railways generally, that the methods in vogue at junctions or other railway centres where passenger or goods services terminate, for disposing of or rounding vehicles, should be periodically examined and reported on by competent officers, in order that irregular methods of working, or insufficient protection in the ways of signals and trap-points, may be noted and rectified."

* * *

Of the Bagdad Railway, a RAILWAY MAGAZINE reader in Mesopotamia writes:—"The line is of standard (4 ft. 8½ in.) gauge, laid on iron sleepers, made to a large extent by Krupp. The locomotives, other than tanks, are either 2-8-0 or 2-6-0 types. All were built in Germany. Carriages are of the old four-wheeled pattern."

* * *

RAILWAY MAGAZINE readers were fairly well spread over the habitable globe before the war, but this great upset to civilisation has had the effect of sending far afield many who in the ordinary course of events would not have travelled far. For instance, a London, Brighton and South Coast Railway former employee and RAILWAY MAGAZINE reader has written from Dadoma, in what was German East Africa, and gives some particulars of the German Central Railway there. It is, he says, a splendidly laid and ballasted line, superior, in his opinion, to the Uganda Railway, the entire length of which he has travelled. He has seen a few eight-coupled tank engines each with a pair of leading wheels. These locomotives are of German construction, but most of the engines used are off the Indian railways and are six-coupled bogies with outside cylinders, built at Glasgow.

* * *

A "ONE-MAN RAILWAY" is described in *Chambers's Journal*. The line is in the United States, and was originally a branch line constructed by the Idaho Southern Railroad in connection with an irrigation scheme, during

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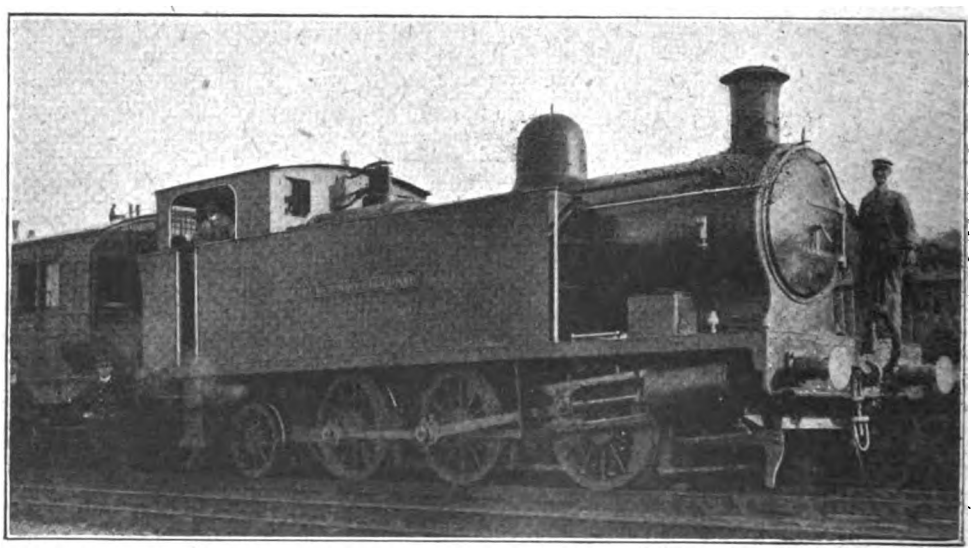
whose progress it was used both for passenger and goods traffic. On the completion of the irrigation works, the Idaho Southern abandoned the line, the State authorities refusing an extension of the charter unless the track and rolling stock were put into a condition which the company did not consider to be warranted by the traffic. Hence the decision to give up the branch. However, an enterprising local man thought there was money in the undertaking and leased it. He then had a petrol car built, with flanged wheels and seating some 16 passengers, as well as two light trailer cars for freight and "express" traffic. The results have more than justified the owner's confidence; the line receives all the traffic it can handle, and the business is, in fact, so great that he has had to order two other sets of motor cars and trailers. The line, it may be added, is worked on a regular time-table, and its operation is perhaps not without interest in this country in view of the difficulties now obtaining with regard to the working of branch lines in rural districts.

* * *

A CORRESPONDENT in Burma does not suppose anyone advocates a line of railway through the various ranges of mountain peak described by Mr. J. Coggin Brown, and by Mr. Kingdon Ward in his interesting book "The Land of the Blue Poppy." What people in Burma have asked for, he says, is something very different. There are two projects, involving a short extension in one case from Lashio to the Kunlon ferry over land which has been already surveyed, and is said to be 100 miles in length; the other from Bhamo to Tengyueh, where there is already a fairly good road and a yearly increasing trade. The journey between these two places is usually performed in eight marches. Lord Curzon, when he visited Burma, vetoed the former line, giving as his reason the small amount of trade from China which reached the Kunlon ferry. But it was thought at the time that fear of hostilities with the Wild Was was the bugbear which made him averse to completing the line to its original destination. The Was has been quiescent now for over 30 years. They would probably be glad if the railway was made, for they are often seen between Lashio and Mandalay. One of these short lines will certainly be laid before another 30 years are passed. The existence of vast snow-clad peaks on the Salween-Mekong divide has really nothing to do with the two short lines in question. No railways are wanted there or to Tibet, but to join the Burmo-Chinese frontier over comparatively easy country where there is already considerable trade.

* * *

THERE was a joint inquiry held in connection with the gas explosion in a third-class carriage on the north-east line of the Madras and Southern Mahratta Railway. It appears that while No. 10 up of December 3rd, 1916, was running between Biccavol and Anaparthi stations, a gas explosion occurred at midnight on the fifth vehicle on the train. The explosion was serious, and resulted in injury to nine third-class passengers, while the coach was partially wrecked. The train was stopped and the injured passengers given first aid. The train then proceeded to Dwarapudi, where the damaged coach was detached. The committee have examined the site of the accident and the damaged coach. The marks on permanent way show that the left-hand gas reservoir came adrift at mile 375/5, the train actually stopping at mile 374/8-9. The point of explosion is clearly and definitely marked by the glass and pieces of wood scattered



Photo] [*Frank Roberts.*

BERE ALSTON AND CALLINGTON LIGHT RAILWAY.
Tank Locomotive, *Earl of Mount Edgcumbe.*

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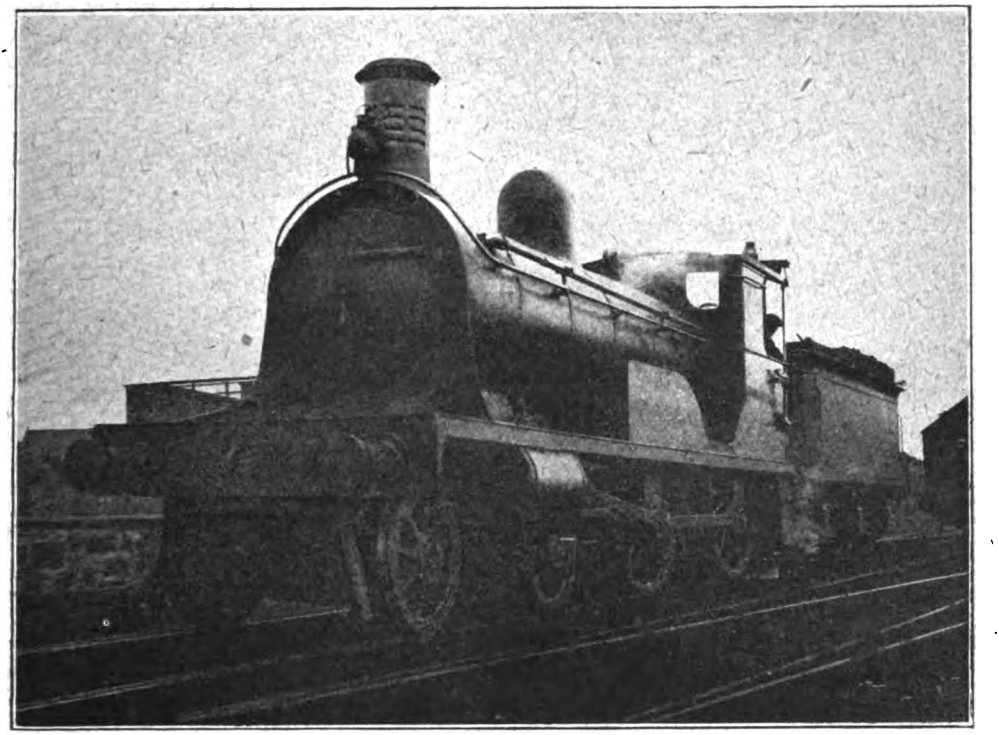

Photo] [*A. E. Glen.*

HIGHLAND RAILWAY.
4-4-0 locomotive, No. 126, *Loch Tummel.*

on the permanent way and by the recovery of a complete lavatory glass and broken window shutters picked up at this mileage. The committee are unable to express an opinion as to what actually ignited the gas.

* * *

MR. S. C. GHOSE, of the Railway Department of McLeod & Co., Calcutta, has published a note on "Indian Railway Extensions and Management and the interest to be taken by Indians in matter relating to railways." In this he states that "the interest to be taken by the Indian people in Indian railways and their development is threefold. The first and foremost is the interest they ought to take in the financing of Indian railways. The second is the employment of Indians in positions of greater responsibility in railway work, and in the construction and management of railways. The third is the interest taken or not taken, but which ought to be taken, on behalf of Indian industries and Indian trade, in the rates charged and the facilities granted by the Indian Railway management."

* * *

URGENT are the warnings against all avoidable travelling that are now being issued by the German railway authorities. The public are told that the restrictions are much greater in England and France, that the German measures are very lenient and that people are wisest to stay at home, where they are certain of food, even if the quantities of food are small. At the same time it is admitted that the Germans now have an unusual need of holidays and sufficient provision of really necessary trains is promised. It is worthy of note that, instead of abandoning the reservation of seats, the German authorities have established the rule that all tickets for "holiday trains" must be bought in advance, and every ticket secures a place in the train. The German people are solemnly assured that as regards coal they are better off than the inhabitants of all other belligerent countries, but they are warned that there will be great privations next winter if the weather is not mild.

* * *

IN an article appearing in a recent issue of *The Railway Gazette* it is shown that the electrification of the Elkhorn length of the Norfolk and Western Railroad has admitted of five electric locomotives replacing 17 steam and of two electric banking engines replacing seven steam. The average number of locomotive miles per day has been increased from 60 to 100, and each electric locomotive finds work for two engine crews every day. Since 1914, when steam operation was in force, the total ton-miles has increased from 457,163,921 to 592,597,018, an improvement of 30 per cent., and this has been accomplished with a decrease of from 93,625 engine-hours in 1914 to 44,112 in 1916, a

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decrease of 48 per cent. The 1914 traffic required 25 Mallet locomotives; the 1916 would have necessitated 33, and to deal with the maximum traffic that was handled by the electric locomotives on one day there would have had to have been 42. Moreover, it is doubtful whether, with the conditions that prevailed when steam operation was in force, these 42 engines could have been accommodated on the length of line, as they could only make 7 miles per hour, as against 14 miles per hour for the electrics. It would, therefore, seem that this work has been a success and that when, in a later issue, we give some similar particulars of the Chicago, Milwaukee and St. Paul, further proof is thus given as to the wisdom of the policy of working freight traffic on heavy gradients by electric locomotives.

* * *

THE Dominion Railway Board have issued a judgment in favour of the application of the Canadian Pacific Railway to be allowed to construct a double-deck bridge over the Summerhill Avenue ravine at Toronto, Ontario, on the north side of their existing bridges. The railway's project was opposed by the city and the Guild of Civic Art on the ground that it would spoil the beauties of the ravine.

* * *

MR. E. J. CHAMBERLIN, President of the Grand Trunk Railway of Canada, has been granted three months' leave of absence, and when Mrs. Chamberlin, who has been ill, is able to travel he will leave on an extended trip. Some railway men in Montreal take this to mean the coming retirement of Mr. Chamberlin, but no confirmation has been forthcoming to this effect. Mr. Chamberlin's contract with the Grand Trunk Railway expired in May, and there is a belief, says the Toronto *Globe*, that he is not anxious to continue as head of the railway.

* * *

CANADIAN Pacific Railway new equipment includes twenty-five decapod locomotives for use in the mountains. Some are still under construction. Following are official dimensions:—

Capacity	275 per cent.
Cylinders	24 by 32 in.
Boiler pressure	200 lbs.
Diameter of driving wheels	58 in.
Total driving wheelbase	20 ft. 8 in.
Rigid driving wheelbase	16 ft. 6 in.
Total weight on drivers	214,000 lbs.
Total weight of engine in working order	240,000 lbs.
Total weight of engine and tender in working order	420,000 lbs.
Water capacity of tender	7,000 gals.
Oil capacity	3,000 gals.

Maximum power for minimum weight is the keynote struck in the construction of these locomotives. They are fitted with superheaters and are oil burners. Other special features are: Casey Cavin air operating reverse gear; Cross compound air compressor; McCord force feed lubricator; and separate hydrostatic lubricator for compressor. The leading driving wheels are provided with a flexible arrangement so that a lateral displacement may take place on curves. This reduces the rigid wheel space of the engine to 16 ft. 6 in., which is practically the same space used on locomotives with only one leading pair of driving wheels. To accomplish this the leading side rods are articulated by means of a ball joint. Notwithstanding the high price of material, the Canadian Pacific has been steadily adding to its rolling stock, having built 1,500 cars last year and having another 2,000 under construction at present.

* * *

A CANADIAN Northern Railway train ran into an open switch near Belleville, and the engine, tender and baggage-car were destroyed. Among the passengers were the president of the line, Sir William Mackenzie, Sir John Aird, and eight or ten members of the Canadian Parliament going home for the celebration of Dominion Day.

* * *

ALTHOUGH the Canadian Pacific Railway has not seen its way clear to replant its railway station flower beds with vegetables this year, all employees have been notified by the General Superintendent that they will be given the right to use all land belonging to the railway and not used for the company's purposes. A plot of land one-quarter of an acre in extent near North Toronto station has been planted with potatoes.

* * *

SINCE the war began nearly 4,000 employees of the Grand Trunk Railway of Canada have gone to the front. Of these, 178 have been killed and 300 wounded. Two have received the Victoria Cross, two the Military Cross, four the D.C.M., six the Military Medal, while three have been mentioned in despatches.

* * *

DURING 1916, the Canadian Pacific Railway handled through its General Baggage Department the enormous total of 7,899,652 pieces, an increase of 264,595 over the previous year. Of this 5,423,057 were passengers' baggage. 1,162,472 milk cans were carried and 844,408 parcels were checked at parcel offices.

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THE RAILWAY MAGAZINE.

LONDON AND NORTH WESTERN RAILWAY:

Liverpool and Manchester to Glasgow Express passing Tebay.

4-cylinder Superheater 4—6—0 Locomotive No. 1161, *Sir Robert Turnbull.*

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Photo] [*Percy E. Coleman.*

NUNEATON STATION.
London and North Western Railway.
Platforms No. 1 and No. 2 looking North. No. 2 Signal Cabin in background.

Nuneaton as a Railway Centre.

By PERCY E. COLEMAN.

A CASUAL glance at a railway map will reveal the importance of Nuneaton as a centre, by reason of its position on the main line, and the convergence of several branches, not to mention its situation on the Midland Railway line between Leicester and Birmingham, and its own commercial importance. The dual interests of the railway and the now progressive Borough of Nuneaton, with its 50,000 population, have grown simultaneously, and the virtual completion of the splendid new London and North Western station in that town forms a fitting opportunity for an exhaustive review of its importance as a railway centre.

A little history is necessary to trace developments. The original main line of the London and North Western Railway from Euston to the north did not touch Nuneaton, but at Rugby took a sweep due west, passing through Coventry, Birmingham and Wolverhampton, continuing *viâ* Stafford to Crewe. It was in the early 'forties that the company constructed the Trent Valley line from Rugby through Nuneaton to Stafford, and in 1848 the first London and North Western Trent Valley train set down passengers in what George Eliot described as Milby's (Nuneaton) "handsome" railway station.

Subsequently, Coventry, nine miles to the south of Nuneaton, was connected up by a short branch, the line passing through a rich mineral district that has proved highly remunerative to the company. The congestion on this section of the London and North Western has indeed become most acute, and it is only by providing very short "block" sections that the traffic can be expeditiously handled. In its short length there are seven collieries, numerous brick and tile works, granite quarries, and (as a war development) many munitions works sidings.

In 1864 the railway came to Nuneaton from yet another direction, the line from Wigston, Midland Junction (Leicester) being opened. It may be noted here that the Nuneaton Midland station was opened in this year and that company's train service between Leicester and Birmingham was

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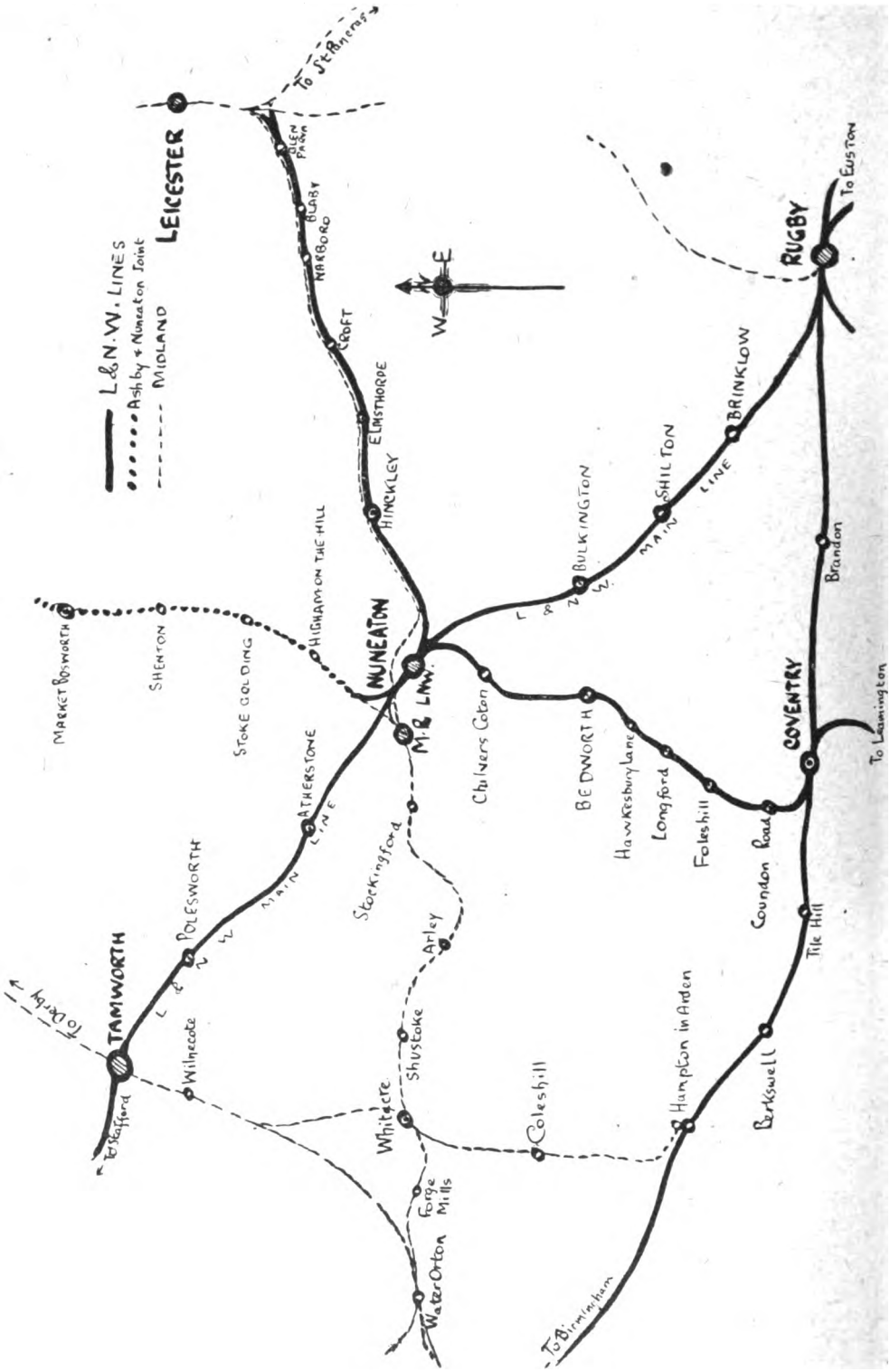

SKETCH MAP OF RAILWAY LINES SERVING NUNEATON.

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inaugurated. By a junction some ¾ mile east of Nuneaton, trains are enabled to run from Leicester into either station at Nuneaton, and both Midland and London and North Western companies maintain a very frequent service of trains under normal conditions.

The traffic at both stations continued to grow, for the vast mineral resources of the district—coal, granite, and clay—were just being effectively tapped by enterprising firms, whose names are now known throughout the commercial world.

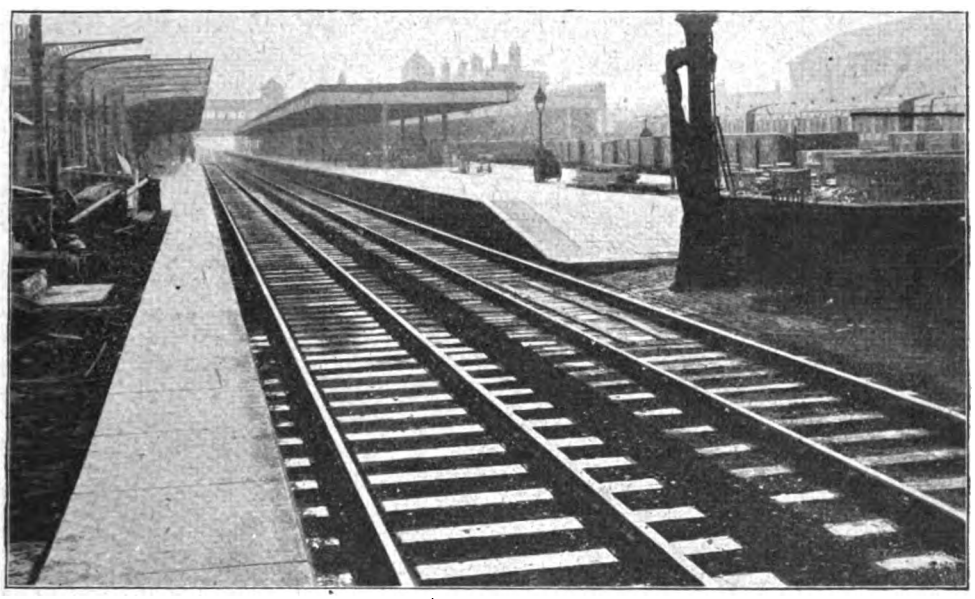
In 1873 the Ashby and Nuneaton joint railway from Coalville and Ashby was completed, a divergence of the line at Weddington Junction, 1¼ miles north of Nuneaton providing a passenger and goods service to both of the stations. This line opened up the vast Leicestershire coal-fields, and the consequent increase of traffic at Nuneaton London and North Western was the cause of acute congestion, with the result that in 1875 the station was greatly enlarged.

From time to time afterwards increasing accommodation had to be provided. The already extensive sorting sidings had to be enlarged to deal with the growing coal and mineral traffic, and temporary extension was made to the passenger station, until at the beginning of the present century the London and North Western directors arrived at the conclusion that to effectively deal with the increasing volume of business, piecemeal methods would no longer do, and a comprehensive reconstruction scheme would have to be tackled.

It will be as well to outline what was the existing station accommodation before proceeding farther. There were three roads between Nuneaton and Rugby, with three fairly long platforms at Nuneaton to correspond. Northwards to Atherstone there were only two roads, and a short bay had to accommodate both the main line "locals" and the Ashby line trains. Two short bays at the south end of the station were used by the Coventry and Leicester trains.

This was the only accommodation for a traffic which nearly reached a total of 300 trains daily, and it need hardly be added that such limited facilities were the direct cause of very serious delay to all kinds of traffic.

In 1906 the main line from Atherstone was duplicated to provide up and down "fast" and "slow" lines, this involving the entire reconstruction of the Ashby Junction, some ¾ mile north of the station. A few years later another road was added to the existing three from Attleborough box to Nuneaton. These widenings only accentuated



Photo] [*Percy E. Coleman.*

NUNEATON STATION.

Platforms No. 3 and No. 4, showing the "fast" main lines. On the extreme left is the extension of No. 4 platform and the new No. 6 platform in course of construction.

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the "bottle neck" character of Nuneaton station, and it was in 1913 that the present building scheme was actually commenced, the contract for the platform buildings being let to Messrs. Kelley & Sons, of Coventry.

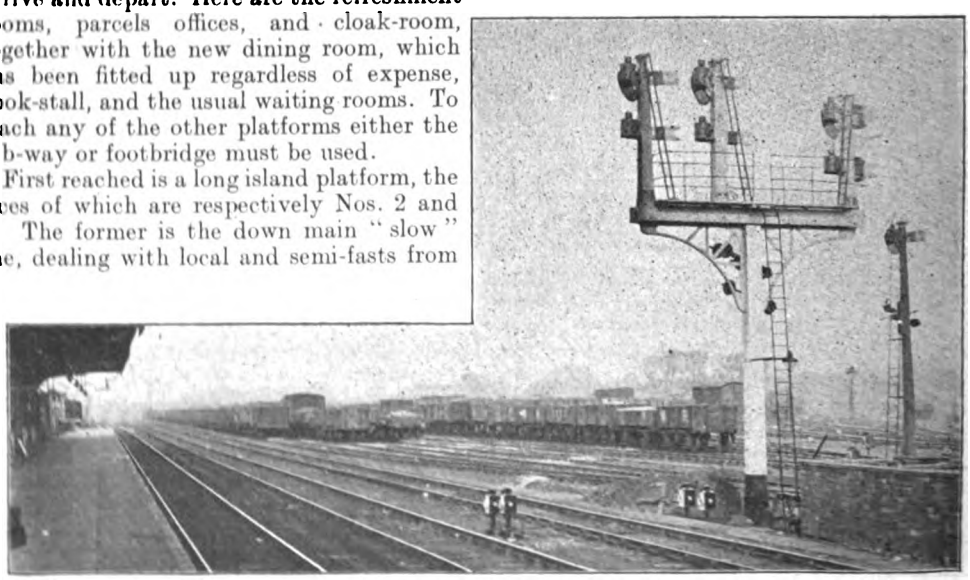
The new station may be described as consisting of five through platforms, with another "bay" constructed so as to be an additional through road if necessary. The front elevation to the main street entrance, though providing a delightful contrast from the dismal property around it, cannot be described as handsome—substantial would be a better word. The four-dial clock tower does, however, add considerable dignity to the façade, and whilst mentioning clocks, it would be well to state that every platform, the booking hall, offices and signal cabins, all have electric synchronised clocks, thus giving absolute uniformity of working throughout.

The large station yard provides ample room for the expeditious movement of vehicles, and direct access is obtained to the booking hall, luggage lifts, or parcel offices. The booking hall has separate entrance and exit doors, is handsomely pannelled in oak, and contains framed photos of London and North Western "beauty spots." Platform tickets are issued from automatic machines, for Nuneaton is a "closed" station. We are at once upon No. 1 platform, from which trains for the Coventry and Leicester lines arrive and depart. Here are the refreshment rooms, parcels offices, and cloak-room, together with the new dining room, which has been fitted up regardless of expense, book-stall, and the usual waiting rooms. To reach any of the other platforms either the sub-way or footbridge must be used.

First reached is a long island platform, the faces of which are respectively Nos. 2 and 3. The former is the down main "slow" line, dealing with local and semi-fasts from Euston and Rugby, and departures for Atherstone, Tamworth and Stafford, whilst at No. 3 (the down main "fast" line platform) arrive the expresses from London and depart some of the important "crack" expresses to the North. On this platform is the stationmaster's office, refreshment and waiting rooms, etc.

Continuing along the subway or overbridge, we reach another "island" platform with an extended bay at its extreme north end. The main faces are respectively Nos. 4 and 5, and the bay is platform 6. No. 4 is the up main "fast," dealing with the important expresses from the North to Euston, and No. 5, the up "slow," accommodates the local trains arriving from Stafford, Tamworth and Atherstone, and departures for Rugby and Euston. On this platform is the telegraph office, the control department, and refreshment rooms. No. 6 platform is exclusively concerned with arrivals and departures for the Ashby, Burton, and Loughborough lines. Although constructed primarily as a terminal road, points are inserted so that trains may cross over to No. 5 platform road and run thereon as a continuation of No. 6 platform line. The five platforms average about 300 yards each in length.

The overbridge connecting the platforms is available for both passengers and luggage, and is therefore provided with lifts and



Photo] [*Percy E. Coleman.*

NUNEATON STATION.
Platform No. 5, and one of the sorting sidings.

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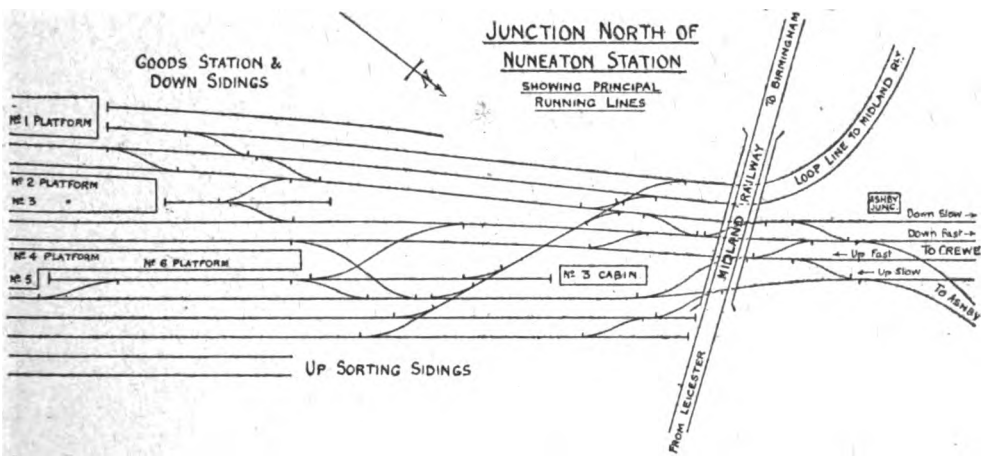
stairways to each platform, and also has direct access to the station yard, providing facilities for luggage to be taken from cars, 'buses, and other conveyances direct to the train for which it is intended. The subway, too, is continued right ahead, and at its opposite end provides an additional entrance and exit from the station, protected, of course, by the platform ticket system.

A tour of the various lines of the district would perhaps be the best method of getting a comprehensive view of the complexity of the interests involved and of showing the importance of the centre under consideration. Approaching Nuneaton from the Metropolis, Rugby Junction is left behind and the Trent Valley section entered upon. Here, too, the "Nuneaton Control" begins, and four roads are provided to the first station—Brinklow—where the old Roman



Fosse way is crossed. To Shilton there is only one down road, but reaching the station, a down "loop" line of quite a mile in length provides ample "passing" facilities. A downhill run and Bulkington is passed. Soon afterwards, the Marston Hall quarry is seen on the left, siding accommodation being provided. One mile further at Attleborough, the four-track road is again entered upon, and this continues for the next 15 miles to Tamworth. At the same time the "suburbs" of Nuneaton are seen on the left, and the aerodrome is passed on the right. Nuneaton was one of the first towns in the country to provide accommodation for our airmen, and the hangars are quite close to the railway. Approaching still closer to the station, the Coventry branch is seen coming in on the left, and the Leicester line approaches on the right. Nearing this junction, the Nuneaton locomotive sheds are passed, and the fine signal gantry under which the main line here passes is worth notice. It has sixteen arms, and indicates to drivers on both down main roads which route they will take through the station. Two more brackets control the actual entrance to the platform roads. By a most elaborate system of points and cross-over roads, the working of this junction is simplicity itself. The Coventry arrivals come in quite independently of the main line trains and go at once to their own No. 1 platform. Arriving down trains can proceed to any platform desired, Nos. 1, 2 or 3, and, what is more important, three trains may arrive simultaneously without fouling one another. The same remarks apply with equal force to departures. The subjoined plan will illustrate the possibilities of working, better than any amount of description. Passing through the station, we come to the net-work of points and roads leading into the two "yards," one on either side of the running lines, and forward to the overbridge carrying the Midland Railway Birmingham–Leicester line over the London and North Western. Whilst this bridge was being rebuilt, about two years ago, the Midland trains worked over the London and North Western line between Nuneaton No. 3 box and the Midland Junction, the unique sight being witnessed of Midland local trains passing through Nuneaton London and North Western as main line "Expresses." We proceed northwards under another large signal gantry carrying twelve arms, which control the "up" lines into the station. Shortly afterwards we pass the Ashby line junction, which goes off to the right. Hartshill and Mancetter quarries sidings are

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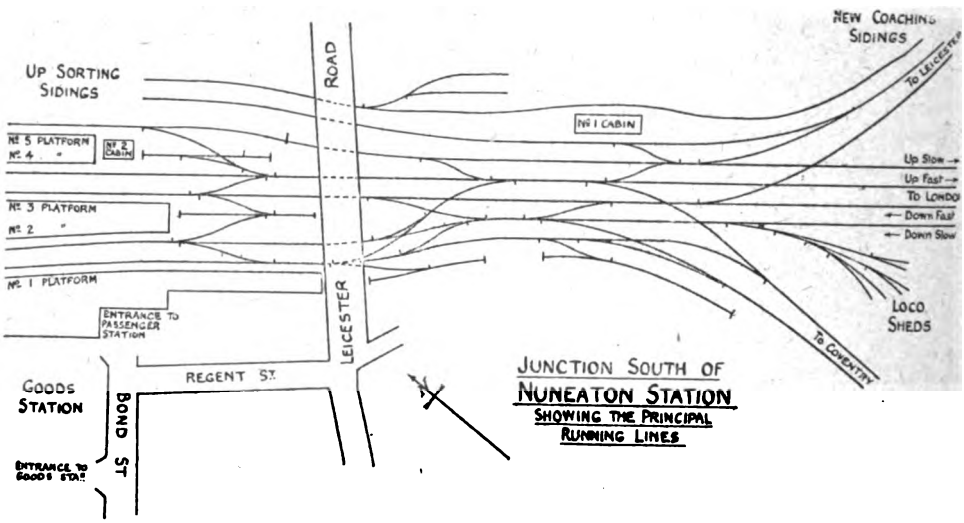
respectively passed, and Atherstone, a small hatting town, 5 miles north of Nuneaton, is reached. Here a bridge carries the line over the old "Watling" Street Road. We need not, for the purposes of this article, pursue the main line any further north.

Next, in importance is the Coventry branch. Leaving Nuneaton, this line curves sharply to the right, past the pretty Riversley Park to Chilvers Coton, a suburban station within the Borough. At the present time this place is dealing with about 3,000 munition workers who daily travel backwards and forwards to their work, cheap weekly tickets being issued. We now come to the colliery district proper. On the right the Griff branch comes in on a very sharp curve, bringing traffic from the Griff Collieries and the brick and tile works of Messrs. Stanley Bros., Ltd. Opposite to it are the sidings of the Griff Quarries. Not more than a mile further on we get the "Charity" Colliery sidings, and a short downhill run brings us to Bedworth station, where a good deal of hatting traffic is handled. A little further on is the Newdigate Colliery branch, and at Hawkesbury Lane station are reception sidings for the Exhall Colliery and Wyken Colliery traffic. These sidings have been recently enlarged very considerably to deal with the growing volume of traffic. Passing over the recently widened road bridge, under which electric cars run to Coventry from Bedworth, we arrive at Longford and Exhall station, and shortly after passing Coventry Corporation Gas Works sidings, we reach "Three Spires Junction," whither goes off the new Coventry avoiding line, by which the coal traffic from the districts just mentioned can be conveyed direct to the London line, east of Coventry, without congesting Coventry passenger station. On the opposite side of the running roads is the line to the Warwickshire Coal Company's pit at Keresley. We are now at Foleshill station, and the Press Censor would not permit any reference to the munitions area which we have entered. Suffice it to say, that traffic continues to grow almost weekly and—this is our point—all that portion of it that goes north centres itself on Nuneaton Junction.

Of the Leicester branch little need be said. Leaving the main line to the right, a sharp curve brings us to the junction with the line from the Nuneaton Midland station, and the efforts of the engine will tell the railwayist that the gradient up to Hinckley (4 miles) is no easy one. Hinckley, as well as Elmsthorpe (the following station), pours a vast stream of boot and shoe and hosiery traffic on to both company's goods services. Forward to Leicester there are the stations at Croft, Narborough, Blaby and Wigston Glen Parva, the former two giving a heavy granite traffic, and the latter two only passenger facilities. Midland trains between Nuneaton and Leicester call only at Hinckley; London and North Western trains usually make all the stops.

The Ashby line passes through a typically rural district; indeed, some very pretty Leicestershire country side villages are passed, which from the railway point of view have no interest. It is when the Coalville, Whitwick and Hugglescote districts are



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reached that the traffic of the Leicestershire coal-fields is met with. There are at least a score of collieries, all pouring their south-bound traffic on Nuneaton. Incidentally, the writer considers the London and North Western Charnwood Forest line from Nuneaton, through Shackerstone Junction to Loughborough, one of the prettiest sections of the "premier" line. All these lines named come under the jurisdiction of the "Nuneaton Control."

A word or two regarding the passenger train services centring on the town. Nuneaton is 97 miles exactly from Euston, and normally there is a good service between the city and the Warwickshire town—about 12 down and 12 up through trains—whilst in both directions additional services can be obtained by changing at Rugby. The quickest down journey under normal conditions is by the 5.30 p.m. Fleetwood Boat Express, which slips a carriage at Nuneaton at 7.18 p.m.—108 min. This carriage went forward to Buxton *viâ* Burton at 7.25, but the war has cancelled the London and North Western through service to Buxton. In the up direction, the fastest times to "town" were almost shared by the 10.46 a.m. and 5.23 p.m. *ex*-Nuneaton, the former taking 105 and the latter 107 min. In both cases the runs were non-stop. Unfortunately, Nuneaton suffers from too close proximity to Rugby for the very best trains to stop; nevertheless, many important trains must of necessity call to make connections with the important branches terminating there. In all there are 22 up main line arrivals and 18 departures in the course of the day, whilst 17 arrivals and 20 departures are seen at the down platforms during the course of 24 hours. In addition, 32 main line expresses pass through Nuneaton during that time without calling.*

The Leicester branch is an exceedingly busy line, passenger trains numbering 20 arrivals, 20 departures. Many of the trains from this line reverse at Nuneaton and run to the Coventry branch, avoiding the transference of passengers and luggage. For the latter line there are 18 arrivals and 17 departures, the six intermediate stations at short distances precluding a very rapid journey; hence the 9½ miles occupies about 30 min. The Leicester branch has also six intermediate stations, so that the 18½ miles occupies about 45 min., though there are some faster trains omitting some stops. On the Ashby and Burton line there are 9 trains "out" and 8 "in."*

Traffic at Nuneaton is controlled by four large signal boxes. No. 1, which has recently been rebuilt entirely, with about 180 levers, is situated 200 yards south of the station, and controls the Leicester and Coventry line junctions, the new coaching sidings, the locomotive sheds, and all the various movements of traffic south of the station. No. 2 cabin is in the station proper, at the south end of No. 4 platform. This has not outwardly been rebuilt, but its internal arrangements have been entirely remodelled and reorganised to meet the new conditions. No. 3 box, some 200 yards north of the station, has also been rebuilt, and contains nearly 200 levers. The Ashby Junction cabin, as its name implies, is at the junction of the Ashby and Nuneaton joint lines, and is somewhat smaller than the others. There are also two other boxes in the goods yards, one on either side of the station, and though they do not deal with through working, they are kept exceedingly busy. In addition to the signal boxes, it must be remembered that Nuneaton is the centre of one of the London and North Western "Control" districts, and was, in fact, the second office opened on the system. All goods trains between Rugby and Stafford, Leamington, Coventry, Loughborough, Ashby and Wigston Junction are operated from the Nuneaton "Control," which has a staff of 17, and between them they deal with about 90,000 wagons every week.

This goods traffic is, indeed, an immense proportion of the whole problem at Nuneaton. There are some 35 or 40 collieries directly centring coal traffic on the Nuneaton London and North Western yards, in addition to brick and tile works, and some seven stone quarries. It can easily be seen, therefore, that in addition to ordinary merchandise, the sorting sidings have a busy time of it. "Hump" shunting is largely adopted, with excellent results.

The Midland station at Nuneaton is about 1½ miles from the London and North Western station. It is an unpretentious building, with two platforms and the usual offices. Passenger traffic is not heavy, there being about 10 trains daily in each direction between Leicester and Birmingham, and all except one call at Nuneaton. A poor service

* Recent alterations have somewhat modified the services mentioned.

* Recent alterations have somewhat modified the services mentioned.

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is provided to Ashby, there being only two trains daily in each direction.* The goods and mineral traffic through this station is, however, exceedingly heavy, and a loop line to the London and North Western line provides ample exchange facilities. The London and North Western Company work through this loop to many of the collieries adjacent to the Midland Railway line, and the Midland, similarly, have running powers over the London and North Western to Coventry, though it is rarely now that a Midland locomotive is seen on that line.

In conclusion, the writer has to express his thanks to a number of railway officials for their co-operation, and particularly to Mr. R. Wright, the ever obliging Nuneaton stationmaster.

* Recent alterations have somewhat modified the services mentioned.

Railway Literature.

THE DESIGN OF RAILWAY LOCATION. By Clement C. Williams. 1917. [New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd. 517 pages. First Edition. Cloth, 16s. 6d. net.]

Primarily intended for use as a text in the classes of technical schools this weighty and valuable work forms a complete treatise on the subject which will be found a help and guide not only to the beginner, but to those engaged in practical work. Much that is written is well known to the latter—still, they will find in the book many wise saws and modern instances which they will welcome as enlightening aid in their work and as reminders of things often forgotten if not even neglected. As Professor of Engineering in the University of Kansas, U.S.A., the author has of necessity collected much material and by experience has acquired the faculty of using such material to the best advantage and in a manner that will explain their value and origin in the simplest manner. The first chapter is a short historical review of the development of railways in the United States; the following 25 chapters are divided into four parts, namely, "Railway Economics and Legislation"; "Operating Conditions Affecting Location"; "Special Problems in Railway Location"; and "Practical Location Survey." In an Appendix are given very detailed specifications for the formation of the roadway, and the last 11 pages are devoted to a good Index. While the greater part of the work refers to American practice there are many conditions common to railways in all parts of the world, including the different parts of the British Dominions. In fact, many of the difficulties met in laying out and working railways mentioned by Mr. Williams have a strangely familiar ring to English railway engineers. There is one point in the notes on Atmospheric Resistance which does not generally meet with the attention due to its importance, and that is the effect of a side wind on the train resistance. "A strong side wind," it is written, "may cause more resistance than a head wind, inasmuch as it forces the car trucks against one rail, thereby causing the flanges to grind on the gauge of the rail. . . . The resistance due to a strong side wind may be equal to or greater than the total train resistance due to motion under ordinary conditions"—in fact, it has been known to pull up a train.

* * *

RECORDS OF RAILWAY INTERESTS IN THE WAR, Part IV., British, August, 1916—August, 1917. [London: The *Railway News*, 91, Temple Chambers, E.C.4. 1s. By post, 1s. 4d.]

The *Railway News* is keeping a record of what is being done by railways in the prosecution of the war, and is doing the work excellently well. The latest published part includes among other valuable matter the following subjects:—Naval and Military Railway Requirements; Merchandise Traffic—Improvements in Methods of Working; Advice to Traders—Passenger Traffic—National Work for Railway Directors and Officers; Honours for Railway Men. In recording Railway Steamships Lost, a full account of the "Murder of Captain Fryatt" is set forth.

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Locomotive and Train Working in the latter part of the 19th Century.

THE LANCASHIRE AND YORKSHIRE RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

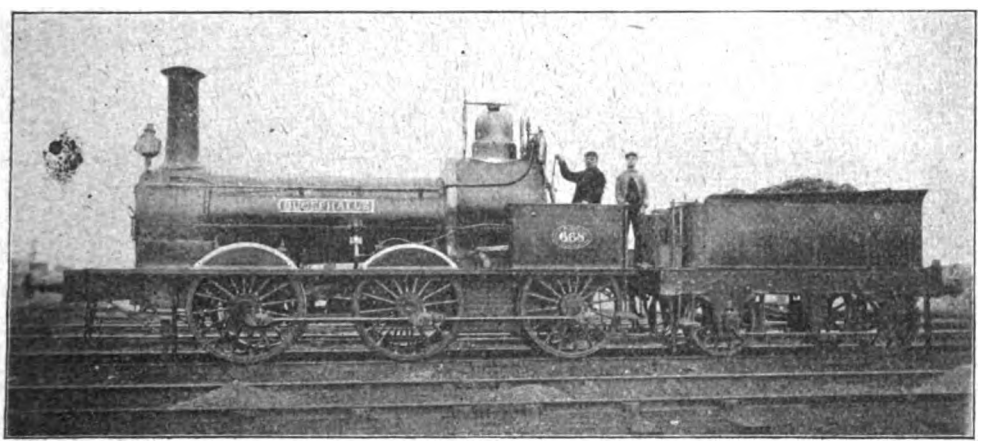
THERE is no railway in Great Britain that has undergone such radical and complete changes as the Lancashire and Yorkshire. In the middle of the "seventies" it was probably the most degenerate railway in the kingdom, to which even the South Eastern or the London, Chatham and Dover could have run only a bad second. And this was in spite of the fact that the Lancashire and Yorkshire was essentially a commercial railway used almost entirely by business men and the working classes. No annual Christmas pantomime in either of the two counties of the roses was complete without a constant running commentary on the misdoings of this railway, and a topical song devoted almost entirely to it. One such Yorkshire chorus had it that—

"He went to Bradford for to dine
By the Lancashire and Yorkshire line;
He waited three weeks at bleak Low Moor,
And when he complained the porter swore
That he ought to have started a month before," etc., etc.

It was wretched doggerel, but it went down exceedingly well with the public, as it was a popular theme, upon which both counties of the roses were absolutely unanimous, albeit they disagreed over many other questions, from former English Kings down to modern county cricket.

A feature of the Lancashire and Yorkshire landscape of this period was the extremely high percentage of red-headed individuals amongst the traffic staff. Just as every London and South Western employee to-day has to wear a red tie, so it would appear that many of the corresponding Lancashire and Yorkshire functionaries of those days had to be provided with red hair. Their heads were not used for the purpose of signalling trains to stop, as far as I am aware, for the trouble then was to get the trains to start, and they would pull-up either on the very slightest provocation, or on none at all.

To sum up, the Lancashire and Yorkshire of 1876 was a railway of ugly inconvenient stations, of old broken-down engines and dirty carriages, and of a superlative



OLD GOODS ENGINE, NO. 668, "BUCEPHALUS" (Jenkins).
Wheels, 4 ft. 10 in. Cylinders, 15 in. by 24 in.
Built at Miles Platting Works, 1859.

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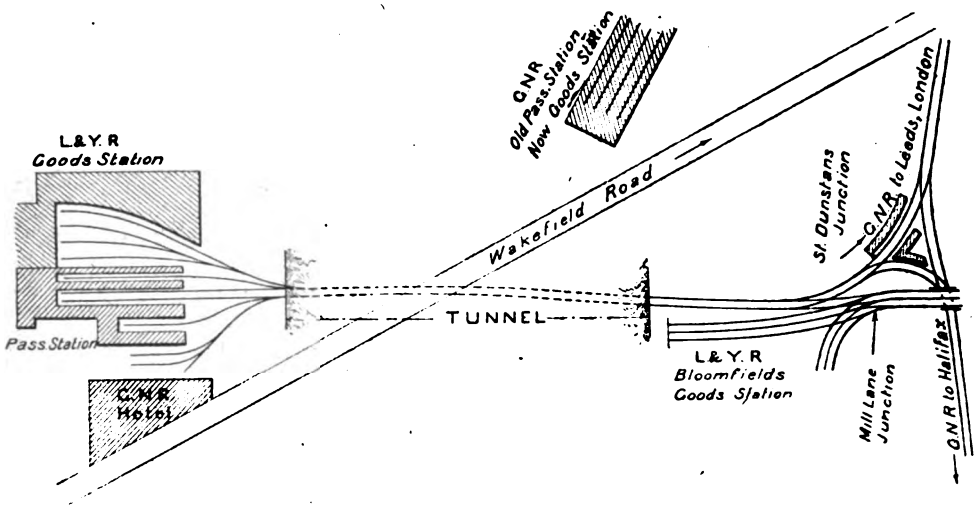

BRADFORD (LANCASHIRE AND YORKSHIRE RAILWAY) EXCHANGE STATION BEFORE 1885.

unpunctuality, to which no pen could do justice.

But to-day all that has been changed. Gone are the old stations, engines, and carriages, and in their places are now well equipped buildings, comfortable bogie coaches, and an entirely new locomotive stock. Of the engines existing in 1876, of which there were 673, only two remain at work, and these are used for special purposes exclusively. And not only has the whole of this stock disappeared, but some 530 engines, their successors of 1877 to 1887, have also either completed their existence or been radically altered. The alteration refers to the re-building of 230 of Mr. Barton Wright's standard goods engines as shunting tank engines; practically the whole of his passenger and tank engines have been scrapped.

The train services call for very little comment in the way of speed. The principal main line was that of the old Manchester and Leeds Railway from the first-named place to Normanton, but the real main line left the former at Copley Junction, near Sowerby Bridge, and went through Halifax to Bradford. Trains to Leeds, as is still the case, ran over the Great Northern metals from Bowling Junction, near Bradford. The fastest trains over this Yorkshire section were the market trains run for the convenience of Manchester and Bradford merchants, and these ran only on market days. On Mondays and Thursdays the Bradford market special express—*first class only*—left Manchester at 9.45 a.m. Its uphill speed to Rochdale was 27 m.p.h., and then by a superhuman effort it managed a speed of about 30 m.p.h. thence to Todmorden, and 32 m.p.h. from the latter place to Halifax. The 40½ miles to Bradford were covered in 1 hr. 25 min., with three intermediate stops. This train returned with the same engine at 5.5 p.m. from Bradford at the same dizzy rate of progress, and landed the passengers in Manchester in time for next day's business. The importance of this express was greater than might be gauged from the fact that any sort of engine was used on it, for I frequently saw a six-coupled goods engine of a very antique appearance with 4 ft. 10 in. wheels working it.

Just as Mondays and Thursdays were the days when the Manchester business men emigrated to Bradford, so the visits had to be returned on Tuesdays and Fridays when Bradford set out for Manchester at 9.25 a.m. I think this train was at one time first and second class only, but third class passengers were allowed to travel by it certainly before 1880. Moreover, it was the crack Lancashire and Yorkshire main line express, for it ran to Manchester, with stops at Low Moor, Halifax, Sowerby Bridge, and Todmorden, in 1 hr. 20 min., and actually covered the 19¼ miles from Todmorden to Manchester in 34 min.—a speed of 34 m.p.h. downhill.

With the exception of these special market trains, it was usual for the trains from Manchester over this section to be run to Leeds by the train engine, and the Bradford portions were detached or attached at Low Moor.

The trains to Normanton were in some

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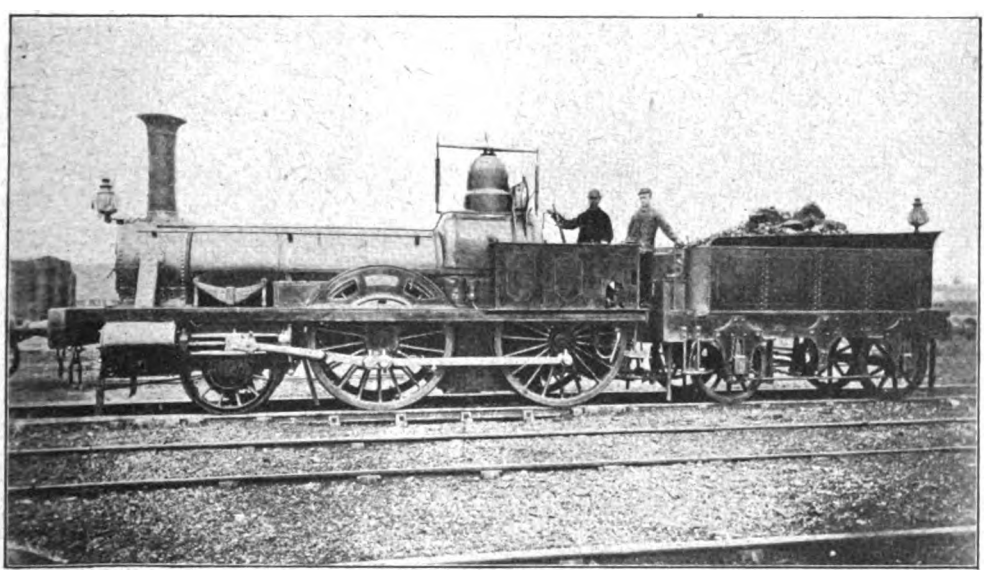
cases worked by Liverpool engines, which ran *viâ* Wigan, Bury and Rochdale. There was then no direct line between Manchester and Liverpool, but a circuitous service was maintained *viâ* Bolton and Wigan. The fastest Liverpool–Manchester express was the 3.35 p.m. from the former city which reached Manchester at 4.50 p.m., with stops at Wigan, Bolton and Salford. Most of these trains from Liverpool consisted of two portions, one for Manchester and the other for Yorkshire; the latter was detached at Bolton, and travelled direct to Rochdale. The best speed over this section in 1880 was that of the above-mentioned 3.35 p.m. from Liverpool, which ran to Wigan at a speed of 39·3 m.p.h.

The Southport train service with Manchester was very fair, considering that the line was the Lancashire and Yorkshire. The daily morning business train, 8.15 a.m. from Southport, in 1880 ran 36¾ miles to Salford in 55 min., and the corresponding evening express in the opposite direction, the 5.0 p.m. from Manchester, covered the 37¼ miles to Southport in exactly one hour. But in 1876 the speed was even better, for this train ran to Blowick at a speed of 40¾ m.p.h. All trains had to pass through Bolton, for there was no short cut, as now, *viâ* Atherton.

The best train from Manchester to Blackpool (Central) was the 4.25 p.m., which reached Lytham at 5.35, with stops at Bolton and Preston. On the return journey, the 8.15 a.m. morning business train took 1 hr. 20 min. for the 51¼ miles from Blackpool to Salford, with stops at Lytham and Bolton. The 34¼-mile run between the two last-named stations was performed in 50 min., a speed of 41 m.p.h. The 4.30 p.m. from Blackpool, in running through to Pendleton, 49½ miles, performed the longest non-stop run on the Lancashire and Yorkshire Railway, at an average speed of 38½ m.p.h. The above seaside trains were the high-water mark of Lancashire and Yorkshire performances in 1880. Between Blackpool and Yorkshire *viâ* Blackburn and Burnley the train service was very poor.

There were two other services, which now form part of the somewhat intricate Lancashire and Yorkshire "cross-country" express mileage. The first was the Manchester–Blackburn–Hellifield service, worked from about 1878 in connection with the Midland Scotch expresses. The time taken in 1880 by the two Scotch train connections in each direction was 90 min. for the 48¾ miles, with stops at Bolton, Over Darwen, Blackburn and Clitheroe. As a matter of fact, this is some minutes better than the present time allowance, for which about 1 hr. 35 min. is about the average. The Lancashire and Yorkshire might possibly retort that the Midland, which railway has worked these trains since July, 1888, is



Photo] [*Locomotive Publishing Co., Ltd.*

2-4-0 OUTSIDE CYLINDER PASSENGER ENGINE.
Wheels, 5 ft. 9 in. Cylinders, 15 in. by 20 in.
Built 1847–1849, originally as single engine (Hawkshaw).

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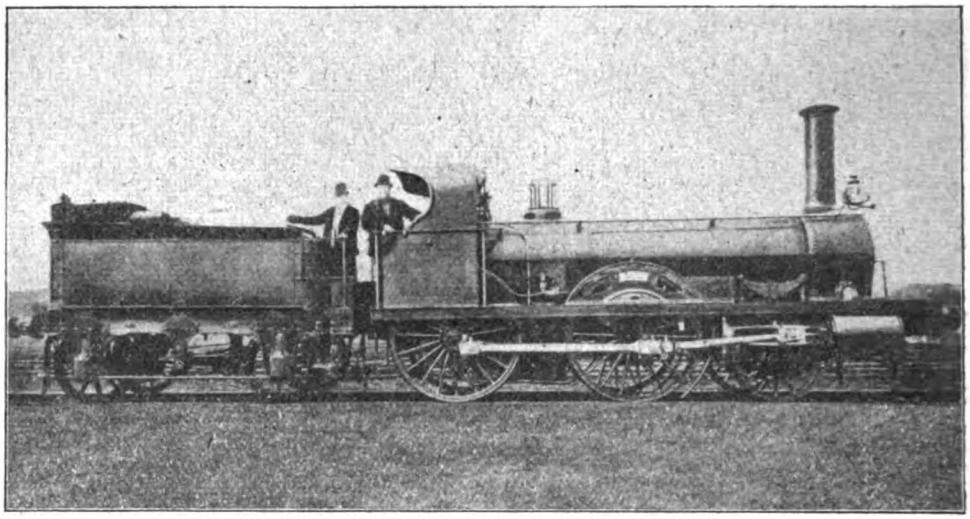

Photo] [*Locomotive Publishing Co., Ltd.*

2-4-0 PASSENGER ENGINE.
Wheels, 5 ft. 9 in. Cylinders, 15 in. by 20 in.
Rebuilt, 1869, with domeless boiler.

responsible for the decadence. Lastly, there is the counterpart of the present-day express service between Bradford, Huddersfield and Penistone (for Sheffield). Writing from memory, I believe that the present route from Wyke Junction to Clifton Road (Brighouse), which considerably shortened the route between Bradford and Huddersfield, was opened either at the end of 1878 or the beginning of 1879, and it was shortly afterwards that the Bradford–Huddersfield section was used for through expresses. The Huddersfield–Penistone section was, however, worked for many years as an adjunct to the Manchester, Sheffield and Lincolnshire Railway's Manchester–London services, for this was the only through route at one time for Huddersfield–London passenger traffic. There were three London trains in 1880 in each direction, which ran between Huddersfield and Penistone, 13½ miles, in 20 min. The Manchester, Sheffield and Lincolnshire engines worked some, if not all, of these trains, and only one carriage went through to King's Cross.

I do not intend to give more than a short description of some of the old stations, nearly all of which have utterly disappeared. Much smoke and more dirt were the features of all of them. Of the old Victoria station, Manchester, a small piece remains. If the railway investigator likes to take a stroll down the one remaining old platform, admission to which may be obtained from Hunt's bank, his first experience, unless he is careful, may be to fall over some commercial traveller's luggage. Having picked himself up, he will find himself on a somewhat deserted bye-way which serves principally as a connection between the Lancashire and Yorkshire station and the old London and North Western Railway station, and also as a dumping ground for some of the large "skips" to which commercial travellers are so partial. The old block of buildings on this platform is the only relic of the old station.

Another well-known Lancashire and Yorkshire feature of the past was the "bottle neck" at Bradford, the name that used to be given to the former two-road tunnel, about a quarter of a mile long, outside the old Exchange station. This bottle neck was a marvel of traffic working, and an unceasing wellspring of torrid language, in which both the railwaymen and the general public took a hearty share. The passenger station was used jointly by the Lancashire and Yorkshire and Great Northern Railways, the latter company having running powers from St. Dunstan's Junction, so that all incoming Great Northern trains had to pass over both of the Lancashire and Yorkshire up and down roads. Unlike the present arrangement, whereby each company has an independent half of the new station, both of them used the four old platform roads indiscriminately. The two departure roads were joined at the tunnel entrance by the

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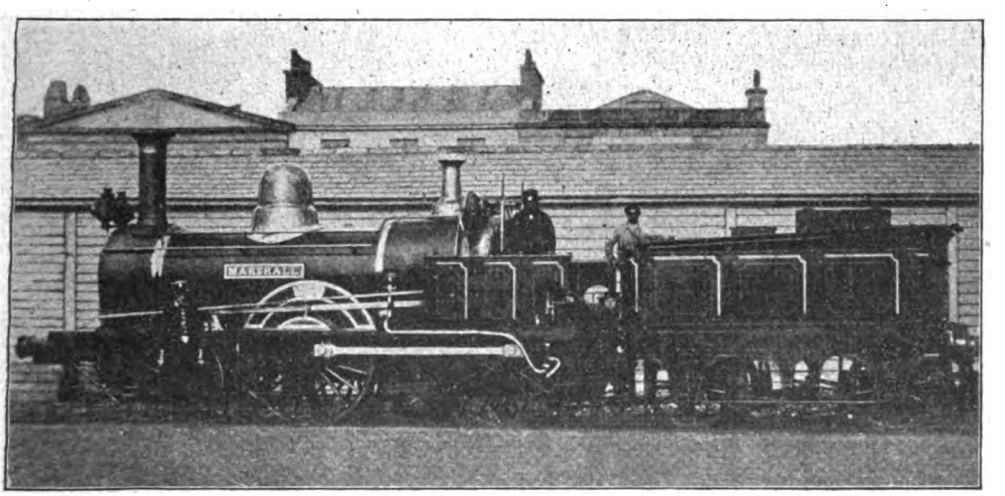
lines from the Lancashire and Yorkshire town goods station, from which a shunting engine was always bobbing into and out of the tunnel, and consequently delaying the outgoing passenger trains. The arrival side consisted of one long platform road and one short bay. All empty trains had to back out from the arrival side into the tunnel, cross over and block the departure lines; the engine then returned to the arrival line and the carriages descended to the departure platform by gravity, for the whole line to the station end of the tunnel was, and still is, on a gradient of 1 in 50 to 1 in 60. Finally, the arrival engine had again to use the cross-over road to back down on to the departure side. The volume of traffic on both railways was very great even in the late "seventies," for there has always been a very extensive local passenger service. The resulting chaos which occurred several times daily can be better imagined than described. There would be some three or four trains waiting to come in, and at least two to go out, and both up and down roads were blocked by a train of empty passenger coaches, which an exasperated staff was trying to transfer from the arrival to the departure side. Added to this the tunnel was full of dense smoke, sulphur, dioxide, and various compounds of tri-nitro profanity, so that it was impossible to see two yards. The shunting engine at the goods station contributed its quota by keeping up a continuous whistle in a vain endeavour to get the points set for it to make a dive into the tunnel, whilst drivers, signalmen and shunters hurled uncomplimentary epithets at one another. There were several smashes, generally and fortunately to empty coaches, and finally, after several temporary wooden structures had been added as enlargements to the station in 1882, the whole was rebuilt and the tunnel taken down and replaced by a deep retaining-wall cutting containing some half-a-dozen roads. The new or present station was opened in 1885, and although it is the property of the Lancashire and Yorkshire Railway, each of the two railways has its own side and independent metals through the approach cutting.

Joint stations have always been a fruitful source of trouble, and it used to be that the "jointer" the station, the worse the accommodation. Huddersfield was a case in point. Here the Lancashire and Yorkshire Railway shared the ownership with the London and North Western Railway, and between them they could provide only one long dismal platform, which was used by all up and down trains of both companies. They also thoughtfully supplied a "bottle neck" tunnel at the south end. Every down train of both companies had to cross over the path of the up trains both when entering and leaving the station.

It is convenient at this stage to say something of the engines in use in 1876 and for a few years afterwards for working the Lancashire and Yorkshire passenger traffic.

The oldest passenger engines consisted of a large number of 2-4-0 tender engines with outside cylinders 15 in. by 20 in., and driving



2-4-0 PASSENGER ENGINE "MARSHALL," NO. 286 (Jenkins).
Wheels, 5 ft. 9 in. Cylinders, 15 in. by 22 in.
Built at Miles Platting Works, 1861.

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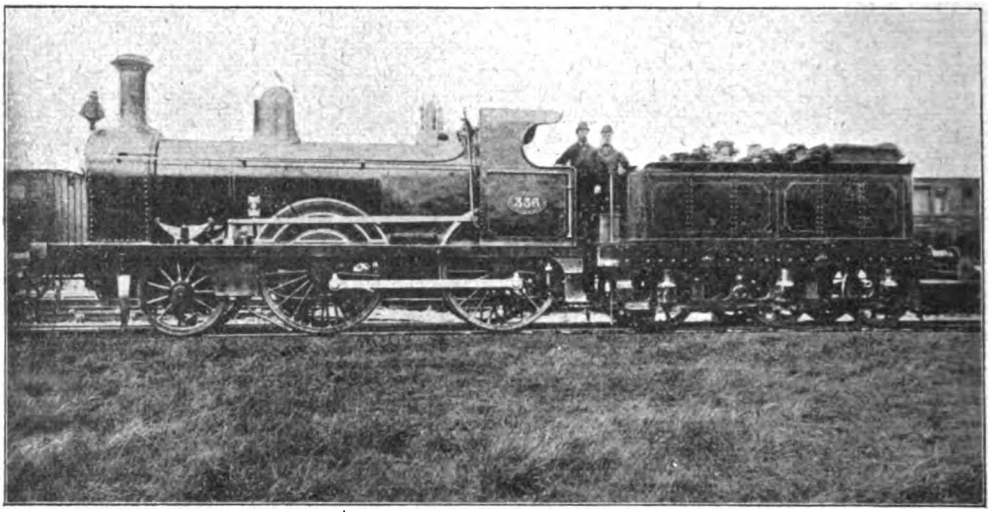

Photo] [*Locomotive Publishing Co., Ltd.*

"MARSHALL" CLASS ENGINE, NO. 336 (1861).
Wheels, 5 ft. 9 in. Cylinders, 16 in. by 24 in.
Rebuilt by W. Barton Wright, 1877.

wheels 5 ft. 9 in. and 5 ft. 10 in. in diameter. Originally designed by Sir John Hawkshaw for the Manchester and Leeds Railway, there had been about 85 of the class, of which some 50 to 60 were still at work in 1876 on all parts of the system, but they had been relegated to the slowest main line and the branch line trains. Originally they had been "single" engines, but nearly all of them, and certainly all those at work in 1876, had been converted between 1868 and 1872 to four-wheels-coupled engines. Many of them had the original boilers with raised fireboxes, on which the domes were placed. The domes of the "Hawkshaw" and early Jenkins engines until 1860 were of "polished" copper. The word "polished" must, however, be understood metaphorically to mean unpainted, for of "polishing" they saw but little, so that these domes presented an iridescent appearance, in which all the colours of the spectrum from red to violet were to be seen—the greens and blues perhaps predominating. The chimneys had copper tops of all sorts of shapes and sizes. These engines progressed to the accompaniment of much rattling and clanking, which conveyed the impression of a barrel of chain links being rolled along the line. A considerable number had been rebuilt with new boilers by Mr. Hirst between 1868 and 1872, and these had Mr. Hirst's standard domeless boilers, with Naylor safety valves, and flush fireboxes. Bent weather-boards were the general form of protection to the footplate, but some of Mr. Hirst's rebuilds had the added glory of cabs of a shape somewhat after the present Great Northern pattern. Although, as mentioned above, they were ubiquitous all over the Lancashire and Yorkshire system, their principal haunts were in Yorkshire, between Leeds, Wakefield and Goole, and between Bradford–Halifax—Huddersfield and Penistone.

The second type or 286 class were in reality express engines, so far as the term express can be applied to the then Lancashire and Yorkshire train service. These were of the 2–4–0 class, with inside cylinders and frames, and consisted of 22 engines in all, with 5 ft. 9 in. coupled wheels and 15 in. by 22 in. cylinders. They had been built in 1861 to 1867 at Miles Platting Works to Mr. Jenkins's design, the chief outward feature of which was an enormous polished brass dome on the middle of the boiler barrel, the shape of which dome was like unto a cottage loaf. There has been nothing similar to this dome on any British railway either before or since, and all classes of engines built by Mr. Jenkins between 1861 and 1868 possessed it. The other outward features were raised fireboxes and an assorted variety of copper-topped chimneys. The class partook of the nature of a cricket club, in that there were two "elevens," of which the "first eleven" were the proud possessors of the names of directors of the line. The second eleven

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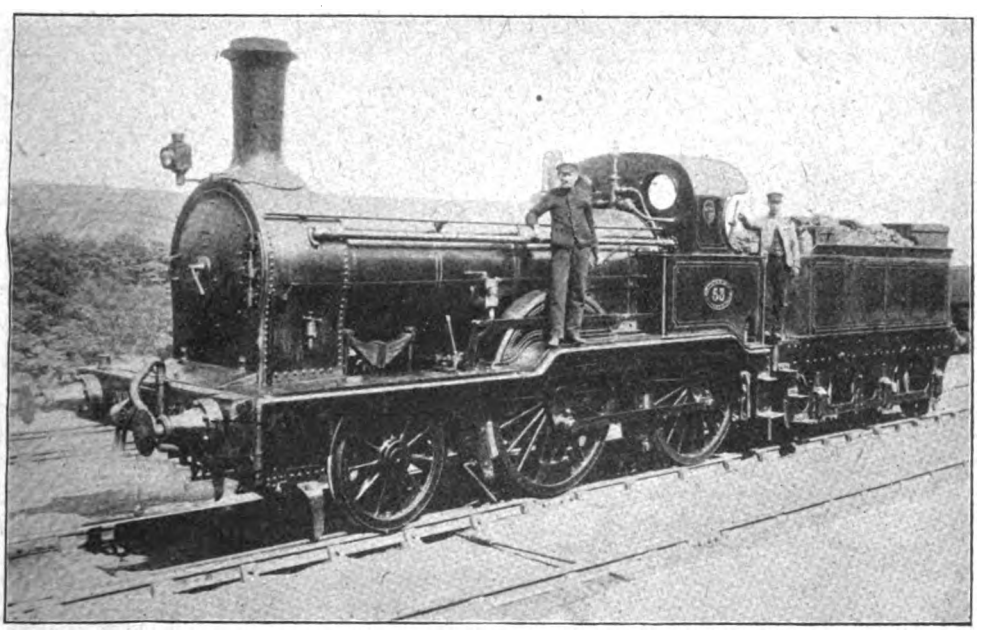
had to rest content without names, presumably because the supply of directors did not run to it, and there were not enough of these dignitaries to go round. The gentlemen immortalised on brass plates on the boilers bore the names of "Marshall," "Audus," "Stuart," "Anderton," "Atkinson," "Wilson," "Wickham," "Barnes," "Hare," "Hatton," and "Pilkington."

Mr. Barton Wright rebuilt eleven of the class—mostly with 16 in. by 24 in. cylinders—between 1877 and 1886, and all of them lasted until Mr. Aspinall's time, when they disappeared between 1887 and 1896. Strangely enough, two or three of those which retained the old Jenkins boilers were the last to go, *e.g.*, No. 15, the boiler of which lasted nearly 30 years. This engine acted as pilot at Newton Heath shed during its declining years.

Most of the 286 class were stationed at Lancashire sheds, and some worked from Manchester on the Blackburn and the Preston services. A number of them at Newton Heath, such as 340, 300, ran regularly to Leeds, and one or two, *e.g.*, 16 and 289, which were at Sandhills (Liverpool) for a considerable period, frequently worked through to Normanton. Most of those which Mr. Barton Wright rebuilt eventually settled at the Yorkshire sheds, Low Moor and Wakefield. In 1879 and for a number of subsequent years the rebuilds 13 and 21 were at the latter station to work the more important main line trains to Manchester. Finally, these, with 287, were transferred to Goole, and finished their career on the Leeds–Wakefield and Goole local service. Just as the London and North Western Railway sent all their "old stagers" to Shrewsbury or Warrington, and the Great Northern express engines were finally relegated to the East Lincolnshire line, in the same way all the Lancashire and Yorkshire passenger classes were one after the other transferred to Goole to finish their existence. The Goole engines worked through Wakefield, and thence over the Great Northern Railway *viâ* Ardsley to Leeds (Central).

The next class to be mentioned are Mr. Hirst's "Straightbacks," as they were called on the Lancashire and Yorkshire. Nearly all Mr. Hirst's engines of 1869 to 1875 had domeless boilers and flush fireboxes, and as the previous engines were all provided with large copper or brass domes and raised fireboxes, the men immediately applied the nickname in question to the newcomers. The passenger "straightbacks," of which the first came out in 1870, performed the greater part of the main line work until about 1883, when they were gradually



2-4-0 EXPRESS ENGINE, NO. 53 (Hirst).
Wheels, 6 ft. Cylinders, 16 in. by 24in.
Built at Miles Platting Works, 1871. The cab was added subsequently.

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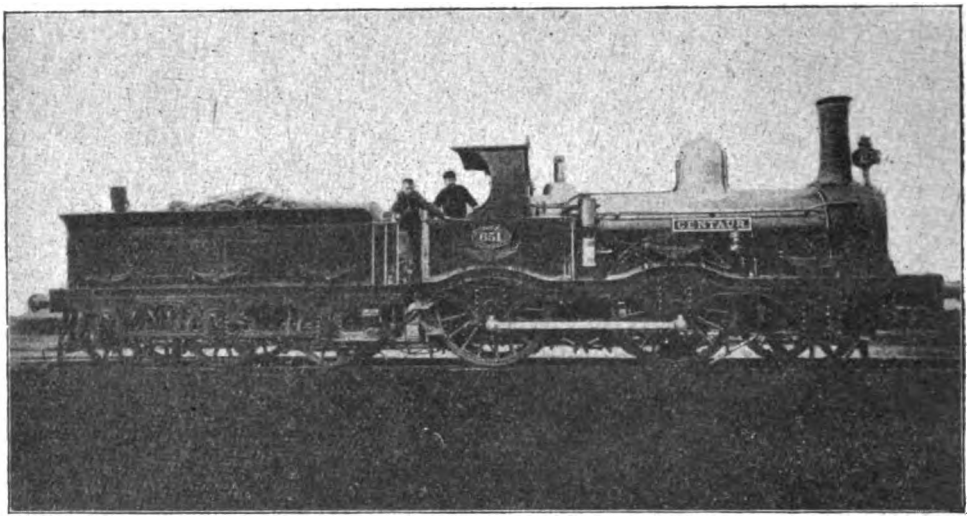

Photo] [*Locomotive Publishing Co., Ltd.*

EAST LANCASHIRE TYPE OF 2-4-0 PASSENGER ENGINE.
Wheels, 5 ft. 6 in. Cylinders, 16 in. by 20 in.
Built at Bury Works, 1876.

superseded by Mr. Wright's new engines. There were 37 engines of the type, all 2–4–0 engines with inside frames to all wheels, and 140 lbs. pressure; all had 6 ft. wheels, with the exception of No. 103, of which the wheels were 5 ft. 6 in. diameter only. In respect to size of cylinders and boilers, there were some distinct variations. The majority had 16 in. by 24 in. cylinders, but the last ten built in 1876 had 17 in. by 24 in. cylinders. Although, as befitted their nickname of "straightbacks," the greater number had domeless boilers; there were ten exceptions, with round topped domes of various sizes, four of which were of polished brass. With the exception of one "hybrid" shunting engine, these were, as far as I remember, the only domed engines built by the Lancashire and Yorkshire during Mr. Hirst's superintendency (1868–1876), after which period all engines had domed boilers.

The two last engines of the class to be built, Nos. 73 and 84, came out from the shops after Mr. Barton Wright had taken charge of the locomotive department, and were provided with very large round topped domes.

All the "straightbacks" were built by the Lancashire and Yorkshire Railway at Miles Platting Works, except the four engines with polished brass domes, which were constructed at the Bury works of the East Lancashire Railway.

The larger engines, with 17 in. cylinders, were stationed at Newton Heath and almost exclusively employed on the Manchester–Leeds and Manchester–Normanton main line trains, in which work they were assisted by several of the 16-in. engines. The domed engines, with the exception of No. 84, which was in the Leeds link at Manchester shed, very rarely ran on the Yorkshire section. Of these, Nos. 44, 52, 73 and 102 were usually to be seen on the Manchester–Accrington, Colne, and Skipton service, and the four brass-domed Bury engines were generally employed on the East Lancashire sections to Preston, either from Manchester or Todmorden. The others of the class were distributed over the Lancashire divisions, a fair number working from Liverpool to Manchester and to Rochdale.

The East Lancashire engines were totally different from the three classes previously mentioned. The original East Lancashire Railway may be compared to the letter T, of which the leg commenced at Clifton Junction, on the Manchester and Bolton line, and passed through Bury, the headquarters of the system, where the works and offices were situated, to Accrington. From this station the eastern branch of the T diverged through Burnley to Todmorden, and the western branch through Blackburn to Preston. After the amalgamation of the two railways, the locomotive department of the East Lancashire maintained an almost complete independence at Bury, but eventually the

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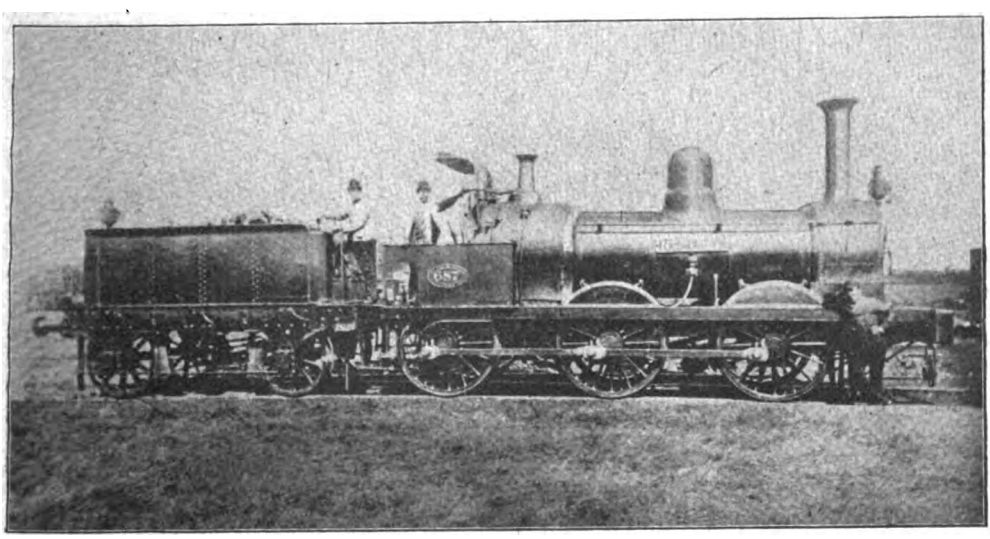
East Lancashire engines, Nos. 1 to 146, had 600 added to their numbers, so that in 1875 they were Nos. 601 to 746, whilst the Lancashire and Yorkshire locomotives proper were Nos. 1 to 527, the missing numbers being blank. But in spite of the semi-independence there was a very involved relationship between the two sections. The passenger engines were all of East Lancashire design and construction, and with the exception of the four "Hirst" engines of 1873, which have already been mentioned, were utterly unlike anything on the Lancashire and Yorkshire system proper.

The goods engines, on the other hand, were almost entirely of Lancashire and Yorkshire design and build, and were supplied by the Lancashire and Yorkshire Railway from Miles Platting, but numbered and named with the East Lancashire stock. And herein lay another distinction. All the East Lancashire engines 601 to 746 had names, mostly of the classical order; none of the Lancashire and Yorkshire Railway engines were thus adorned, except the eleven Jenkins passenger engines named after directors, which have already been described.

The East Lancashire passenger engines were extremely pretty little engines with copper-topped chimneys of various shapes, many of which were somewhat after the old Great Western pattern. They had polished brass domes, generally close to the chimney, but some on the middle of the boiler, and one or two, as in 673 *Blacklock*, were placed on the raised firebox. They were all supplied with very neat cabs almost the same in design as the London and North Western Railway Crewe pattern, and the splashers were provided with double brass band beadings. All were 2–4–0 engines with double frames and outside cranks, and the design had obviously grown out of the old Sharp singles of 1848 to 1853, in fact, one or two of the class had originally been Sharp singles. The coupled wheels were 5 ft. 6 in. in diameter, and the cylinders 15in. by 20in., but four later engines of 1875–1876 had 16 in. by 20 in. cylinders, and the two last engines to be built at Bury in 1877, Nos. 662 and 680, had 16 in. by 24 in. cylinders.

The East Lancashire passenger engines were not, however, always confined to the red rose county. From 1876 they began to drift in increasing numbers into Yorkshire, and for two or three years 633 *Mazeppa*, 634 *Tamerlane*, and 640 *Fireking*, were used on the service between Leeds (Midland) and Doncaster *viâ* Pontefract. In 1879 these three engines, together with 615 *Æolus*, 618 *Titan*, 631 *Orion*, and 673 *Blacklock*, were transferred to Low Moor, and worked the non-stop expresses between Bradford and Halifax for a considerable period. Engines 601 *Odin*, 603 *Clio*, 608 *Jupiter*, 629 *Ariel*, 638 *Phantom*, and 651 *Centaur*, migrated at about the same time from Lancashire to Goole, to work the train service from that



Photo] [*Locomotive Publishing Co., Ltd.*

0–6–0 GOODS ENGINE, NO. 687, NEPTUNE (Jenkins).
Wheels, 4 ft. 10 in. Cylinders, 16 in. by 24 in.
Built at Miles Platting Works. Period, 1864–1868.

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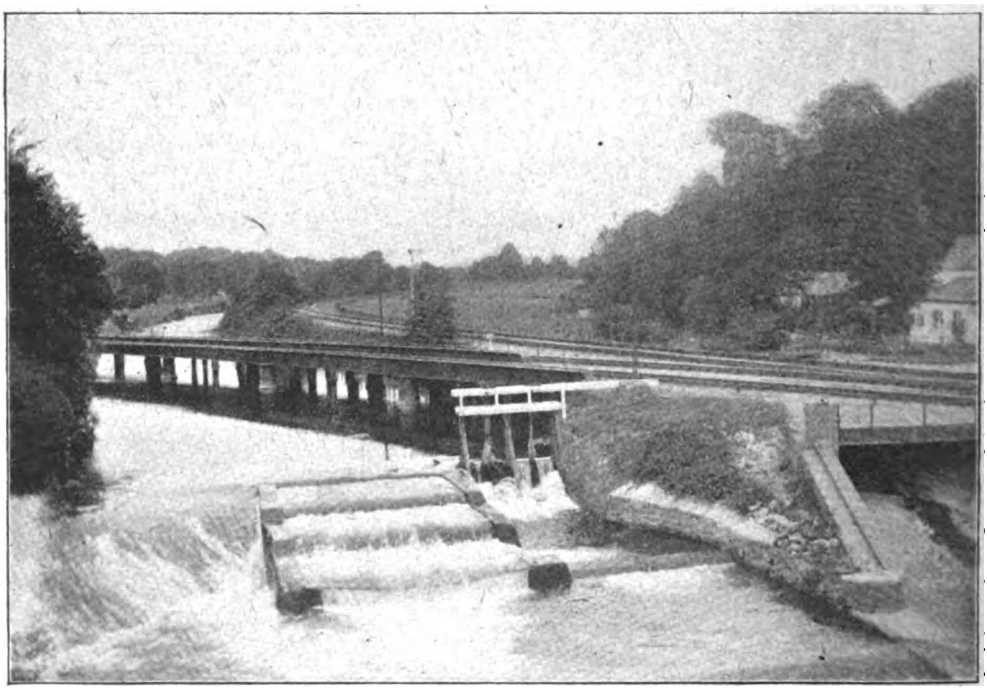
town to Leeds (Central). Of these, 601 and 651 were for a long time fitted with the Westinghouse brake. Most of the remainder of the class remained in Lancashire, and Lostock Hall (Preston) shed provided a home for many of them, such as 630 *Phæton*, 649 *Gazelle*, 653 *Vivid*, and 713 *Juno*, which continued to work over the East Lancashire lines.

Generally speaking, these engines, small though they were, were the fastest and smartest running engines on the Lancashire and Yorkshire Railway, the ten Ramsbottom Crewe-built engines possibly excepted. They were the only engines of that day that could run the 15-min. trains between Bradford and Halifax, a distance of 8¼ miles (of which the first 2 miles out of Bradford are on an exceedingly steep rise, mostly 1 in 50) with any regular punctuality. True, there were other more powerful engines, but the latter did not seem able to run, and anything above 30 to 35 miles per hour appeared to distress them visibly. But the trains of that day were extremely light, and the standard Lancashire and Yorkshire train then almost invariably consisted of four four-wheeled coaches and a brake van. Occasionally an extra coach was added, but it was more usual to increase the accommodation by adding another duplicate set of four coaches and a van when the stress of heavy traffic demanded it. In the early "eighties" the four-wheeled coaches were replaced by six-wheeled ones.

(To be continued.)

A PICTURESQUE SPOT IN THE WEST.



Photo] [*F. H. Stingemore.*

COWLEY BRIDGE JUNCTION, EXETER.
Great Western Railway to London in centre.
London and South Western Railway to Plymouth on the right.

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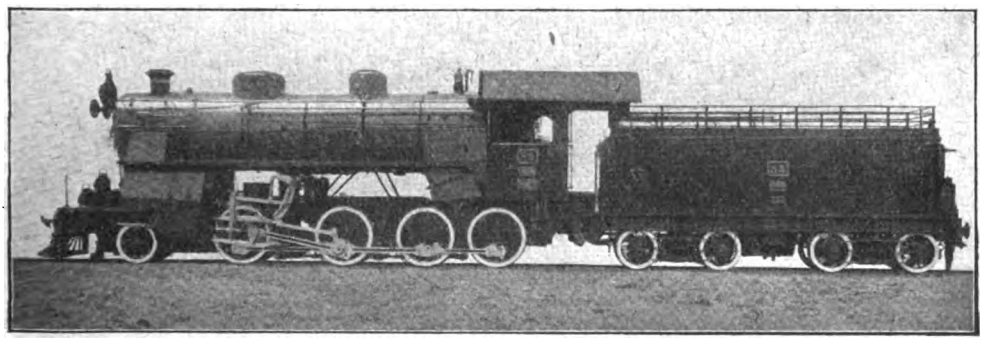
The Railways of Java.

By MAJOR F. S. WATSON, R.A.

JAVA, as the chief island and headquarters of the Dutch East Indies, possesses a fairly complete railway system. The other islands, except Sumatra, have practically no railways at all. Java is about 600 miles long and varies in width from 60 to 120 miles. It has many volcanic mountains of great height —some in groups and some isolated. It might appear from this that the country would be generally unfavourable to railway construction; but this only applies to the eastern and western extremities, the centre of the island consisting of low flat plains with isolated mountains rising from them.

planted where the climate suits them. European vegetables are grown in the higher parts, such as peas, beans and potatoes. Tobacco has also been tried, and vanilla, but more tobacco is grown in the adjoining island of Sumatra.

Chief towns are the four principal ports, all on the north coast: Batavia (the capital), Cheribon, Samarang and Sourabaya, though there is one sheltered harbour on the south coast (Tjilatjap), and a port on the east coast (Banjoewangi). There are few towns of any great importance inland: Sourakarta or Solo (the old capital), and Djokjakarta or Djokja in the centre; Malang in the east,



Photo] [*Kurkdjian, Soerabaia-Java.*

JAVA STATE RAILWAY.
2-4-0 locomotive, No. 909.

The eastern district is mountainous, the chief differences of level being over the Klakan Pass and the section from Kalisat to Banjoewangi. In the west the line traverses what is known as the Preanger Country, a mountainous plateau with an average height above mean sea level of about 2,500 ft., falling steeply to the sea on the south coast, but with a strip of low lying level country 30 or 40 miles across, dividing it from the Java Sea on the north.

The country is almost entirely agricultural. Rice is cultivated in practically all parts, and sugar in the centre and east. Tea and tapioca, coffee and cocoanuts have been

and Bandoeng, in Preanger, being the most important. But mention should also be made of Buitenzorg, about 40 miles inland from Batavia, the site of the Palace of the Governor of the Dutch East Indies, a favourite hill residence for Government officials, within easy reach of Batavia, and which also possesses one of the most famous botanical gardens in the world.

Java is very thickly populated, the natives being branches of the Malay race, of several distinct types. There are also Chinese and, of course, Dutch. Traffic is, therefore, of a very mixed type, but deals chiefly with the produce of the country. The natives do a

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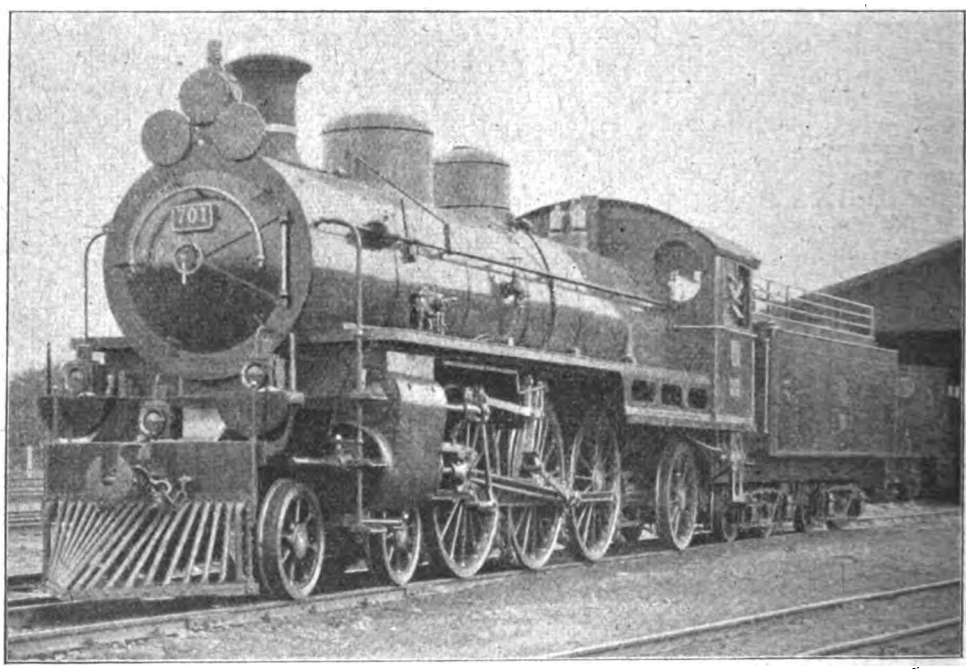
certain amount of travelling, and all trains run third class carriages. In fact, some trains do not have any first class at all.

The first railway to be built in Java was that from Samarang to Tanggoeng, 25 kilometres in length, opened August 1st, 1867. This was part of a scheme called the Samarang–Vorstenlánden Railway, to run from Samarang to Solo and Djokja. It had been originally proposed about 1840, and horse traction was at first suggested. Nothing came of this proposal, nor of one suggested 10 years later. The third try was more successful, and the concession granted to the

was made on a line from Sourabaya to Pasoeroean. This was opened in 1878, and proved so successful that further lines were projected until, at the present time, there are close on 1,400 miles of line open or projected, all of 3 ft. 6 in. gauge and belonging to the State, except the Samarang–Vorstenlanden line of the N.I.S., which still has the 4 ft. 8½ in. gauge.

It will be seen by reference to a map, that the State Railway lines are interrupted between Solo and Djokja by those of the N.I.S., with a 4 ft. 8½ in. gauge. Here a third rail has been laid down, and the State



JAVA STATE RAILWAY.
4-6-2 locomotive, No. 701, at Djokja. Built Winterthur, 1910.

"Nederlandsche Indische Spoorweg Maatschappij" (Dutch Indies Railway Co., usually referred to as N.I.S.), who constructed the line on the 4 ft. 8½ in. gauge. The line was opened to Djokja in 1872.

In 1873 the N.I.S. opened a new line from Batavia to Buitenzorg, constructed, however, on the 3 ft. 6 in. gauge, this being considered more economical, with due respect to the requirements of the country. In the same year a branch was made to the old line, from Kedong Dati to Willem 1.

In 1875 the Government decided to take the railways into its own hands, and a start

Railway has running powers over this section, using its own rolling stock. This enables through trains to be run from Batavia to Sourabaya. The N.I.S. also runs some narrow gauge trains between these two towns.

The Batavia–Buitenzorg line, originally belonging to the same company, has recently been bought by the State. At Buitenzorg it connects with the Bandoeng–Padalarang line of the State Railway (Staats Spoorweg, or S.S. line). It has a branch from Batavia to Tandjong Priok, where the docks are situated. There is a short branch at Meester

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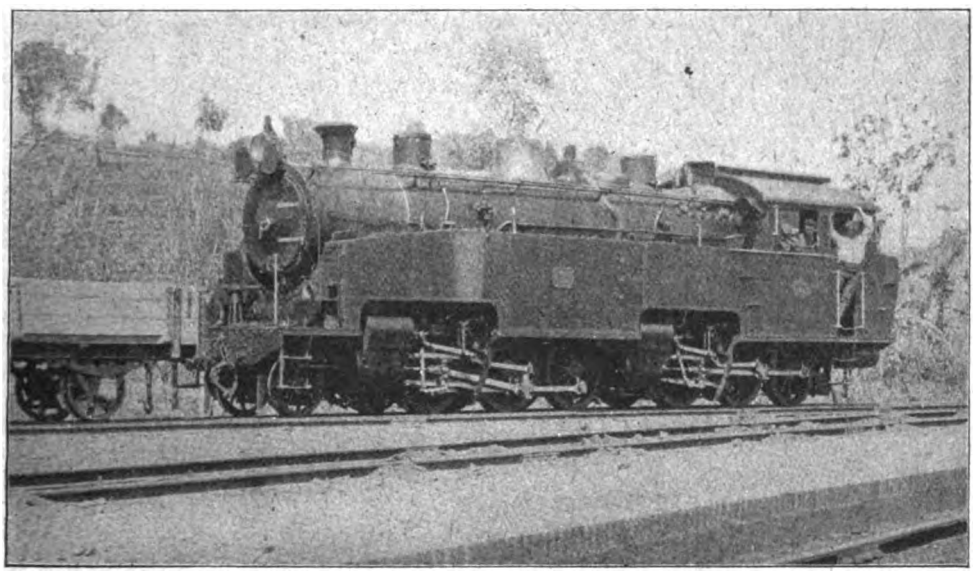
Cornelis to the workshops which are situated there. On the S.V. line the workshops are at Samarang and Djokja.

The State Railway is divided into two sections, the eastern and western, each with its own General Manager and staff. There is a "Chief Inspector," who controls the whole concern. The eastern section has its headquarters at Sourabaya, the western at Bandoeng. Each section has its own rolling stock. The total numbers owned by the S.S. are about 350 engines, 800 carriages and vans, and between 5,000 and 6,000 goods wagons.

Any account of railways in Java would be incomplete without mentioning the tramways. There are, of course, electric trams in some of the large towns, and also steam trams which run along the streets, but the most important are those in the country, of which there are some 1,200 miles, or more, open. These are really light railways, and in some cases run "fast" trains, *i.e.*, trains not stopping at all stations. They are usually built along the roads, at the side, but occasionally take short cuts across country. They have stations similar to those on other lines, and other stopping places—"halts," in fact. These lines are very important, as they act as feeders to the main line, and being of the same gauge (3 ft. 6 in.) wagons can be run through from the railways proper. Most of these railways are in the hands of private companies, one of which owns nearly 250 miles of line. The N.I.S. owns a number of these lines; and some are owned by the State.

To return to the railways, permanent way consists of the ordinary Continental type of rail bolted to wooden sleepers. Rails appear to be very light, probably not more than 60 lbs. to the yard, if that. All points and crossings on the S.S. have steel sleepers, and are evidently sent out, ready made, from Europe.

Signals employed on the S.S. are disc signals. The N.I.S. use the Continental form of semaphore as well: the arm is horizontal when at "danger" and raised when "off." The disc signals are worked by double wires (two to each signal) from the station, and are never very far away. They appear to be used only at either end of a station to give permission, or otherwise, for a train to enter. Points are always moved by hand levers at the points themselves.



JAVA STATE RAILWAY.

2-6-6-0 Tank locomotive, No. 558, at Tjibatoe. Built Amsterdam, 1911.

The main line of the S.S. runs from Batavia to Sourabaya. On leaving Batavia the line is level for a short distance, but very soon starts climbing up towards Bandoeng, which is over 2,000 ft. above the sea. From there to Tjibatoe it winds along the mountains, sometimes up and sometimes down. After Tjibatoe, it drops steeply to Bandjar,

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and from there it falls more gently to Maos. Gradients on this mountain section are very severe, 1 in 50 being very common, while 1 in 45 occurs in places. Curves, also, are very sharp, and short high bridges over deep and narrow ravines are numerous; but tunnels are few, their being only about four on the whole island.

From Maos to Djokja the line rises slightly, falls slightly to Solo, and is fairly level the rest of the way to Sourabaya. In this section various large rivers are crossed, and the bridges have to be built to cope with sudden heavy storms which very quickly swell the rivers.

The chief other lines of the S.S. are from Sourabaya to Banjoewangi, with a branch to Panaroekan; Batavia to Cheribon, from which Samarang can be reached by steam tram; Batavia to Laboean, with branch to Anjerkidoel; and the loop line round the Arjuno and Kawi mountains from Bangil to Malang and round, re-joining the main line at Kertosono.

With the exception of a short length in Batavia, it is all single line, but the express trains on the S.S. are not delayed at all at passing stations. On the N.I.S. between Solo and Djokja there is a distinct slackening through each station, and so the systems in use appear to be different. The train service on most of these lines consists of one or two fast trains, and a number (six to eight as a rule) of slow "mixed" trains, stopping at all stations. Occasionally there is a medium fast train as well. Goods trains, not conveying passengers, are also run, but the majority of the traffic is carried by the mixed trains. This applies also to some of the "tramways." No trains are run at night, as the Dutch do not trust the natives, who comprise most of the railway staff, station-masters, etc., though there is a fair sprinkling of Dutchmen and half-castes among them.

One can well believe this, as they seem to make quite a business of the ordinary daylight trains even. The main line expresses are dealt with comparatively quickly, but on the branch lines one sometimes wonders if one is going on at all that day. Not that some attempt is not made, as uniformed officials blow their whistles and others hoot on little horns, but the driver is indifferent to all this. Suddenly, when one has given it up as hopeless, an unobtrusive coolie rings a bell hung up on the wall of the station buildings. This always has immediate effect, and, with a final shriek from his whistle, the driver opens the regulator and the train is off at last.

It might be imagined from this that accidents would be of common occurrence; but such is not the case, the only serious accident of late years being due to a collision

"JAVA EXPRESS."
2-6-6-0 Tank locomotive, No. 554.

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with a water buffalo. These animals weigh considerably more than the ordinary British cattle, and the trains are lighter, so the accident, which happened on a bridge near Batavia, had serious results. The train was derailed and fell into the river with portions of the bridge as well. About 25 people were killed and 80 injured. Curiously enough, a similar accident occurred near the same place about three weeks later, but the only casualties were the death of the fireman and injury to the driver. The train, this time, was only partially derailed. A few days later another train was just stopped from a similar collision with four buffaloes.

The distance from Sourabaya to Batavia is about 540 miles, but, owing to the fact that no trains run at night, it is impossible to do the distance in one day. The two principal express trains run as follows :—

Miles.			
0	Weltevreden ..	dep. 7.0 a.m.,	2.40 p.m.
105¾	Bandoeng ..	arr. 11.4 a.m.,	7.20 p.m.
	,, ..	dep. 11.9 a.m.,	5.50 a.m.
346	Djokja ..	arr. 7.13 p.m.,	1.38 p.m.
	,, ..	dep. 6.23 a.m.,	1.45 p.m.
544½	Sourabaya ..	arr. 1.31 p.m.,	7.30 p.m.
	Sourabaya	dep. 5.45 a.m.,	9.24 a.m.
	Djokja..	arr. 11.28 a.m.,	4.34 p.m.
	,, ...	dep. 11.35 a.m.,	5.50 a.m.
	Bandoeng	arr. 7.32 p.m.,	2.19 p.m.
	,, ...	dep. 5.55 a.m.,	2.24 p.m.
	Weltevreden	arr. 10.21 a.m.,	6.13 p.m.

This table shows that, if night running was allowed, the whole distance could be done in about 18 hours, though the quickest time now is 24½ hours. This cannot be considered bad, considering the stops, the hilly nature of part of the route, and the small gauge of the railway.

Longest non-stop run is from Solo to Madioen, 60¼ miles in 89 min. going eastwards, and a minute quicker in the other direction, or 40·6 and 41·1 m.p.h. respectively. On the other level sections, booked speeds between stations are also as high as 40 m.p.h. in some cases, and the engines seem to be able to improve on this when delayed. To quote an actual case. From Koetardjo to Maos is 55·4 miles. The train (a light one as English standards go, one four-wheeler, six eight-wheelers and a dining car—probably not much more than 100 tons, booked to do the distance in 80 min., 41·5 m.p.h.) left Koetardjo 9½ min. late, and picked up 9 of these minutes in the distance, averaging close on 47 m.p.h. and reaching to 55 m.p.h. between passing stations. The engine was one of a modern 4–6–2 class built in Switzerland. If it were not for the fact that no traffic is allowed at night, the train service could be considered very good for such a country. Somehow, one does not expect speeds of 50 m.p.h. in the Tropics. But the stopping of the trains by dark spoils it all, and is especially noticeable in the postal service, which, especially the parcels post, is very slow.

To deal with these various classes of traffic a variety of locomotive types are in use. Taking the S.S. first :—

For express work on the level stretches between Sourabaya and Bandjar a powerful looking 4–6–2 engine is employed. These are two-cylinder simple high-pressure engines using superheated steam, built in Switzerland and Germany, with eight-wheeled tenders.

Between Bandjar and Tjibatoe the line rises 1,900 ft. in 60 miles, with gradients of 1 in 50 in places, and here a 2–12–2 tank engine is used. They were built in 1912 in Hanover.

From Tjibatoe onwards another type of engine is used. These are Mallet 2–6–6–0 compounds, and are very extensively employed—almost exclusively in this section and also in East Java for heavy goods and mixed trains. There have been several batches of these engines, and there are now about 35 in service, the latest batch of 11 engines being slightly larger than the others. They were mostly built between the years 1905 to 1909 by various Dutch and German firms.

For the last level bit into Batavia some 4–4–0 simple German engines are used, and compound engines of a similar looking type are used on the Sourabaya–Pasoeroean section, where we also find some early 2–4–0 engines by Sharp, Stewart & Co.

On the Padalarang–Buitenzorg section a smaller edition of the Mallet tank engine is used, of the 0–4–4–2 type, built about 1899. The gradients in this district are very severe, but the trains are, as a rule, lighter, the greater part of the traffic going direct *viâ* Krawang. Two engines are, however, frequently seen on heavy trains.

The latest type of engine is a German built 2–8–0, 47 tons, goods engine, with an eight-wheeled tender weighing 36 tons, total 83 tons. Besides these, there are numerous tank and shunting engines, the latest tank engine being of the 2–6–0 type.

Principal dimensions of these engines are :

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	Type.	Cylinders.	Driving Wheels.	Weight in working order.			Weight on Driving Wheels.	Heating. Surface.	Boiler Pressure.
				Engine.	Tender.	Total.			
			Ft. In.	T. C.	T. C.	T. C.			
	4–6–2	18 × 23½	4 11	52 12	35 0	87 12	29 4	1,700	173
	2–12–2 T	21 × 20	3 8	75 8	—	75 8	60 10	1,660	173
Larger	2–6–6–0 T	13½ / 20½ × 20	3 8	61 18	—	61 18	55 18	1,490	173
Smaller	2–6–6–0 T	13½ / 20½ × 20	3 8	57 4	—	57 4	51 0	1,460	173
Simple	4–4–0	15 × 23½	4 11	33 8	20 10	53 18	19 4	1,100	173
Comp'nd	4–4–0	15 / 23 × 20	4 11	31 6	20 5	51 11	18 0	920	173
	2–4–0	15 × 18	4 8	19 17	12 15	32 12	15 5	560	143
	0–4–4–2 T	12 / 18 × 20	3 8	40 18	—	40 18	34 0	1,090	173

The N.I.S. engines are divided into three divisions:

(1) Broad gauge.

(2) Narrow gauge. (Samarang–Vorstenlanden.)

(3) Narrow gauge. (Batavia–Buitenzorg.) (Recently taken over by the State.)

(1) *Broad Gauge Engines.*

An older type, built in 1872 by Beyer Peacock & Co., 0–4–2 with inside cylinders.

A later type, 4–6–0, built in 1910 at Chemmitz, Saxony.

These types are used for main line trains between Djokja and Samarang.

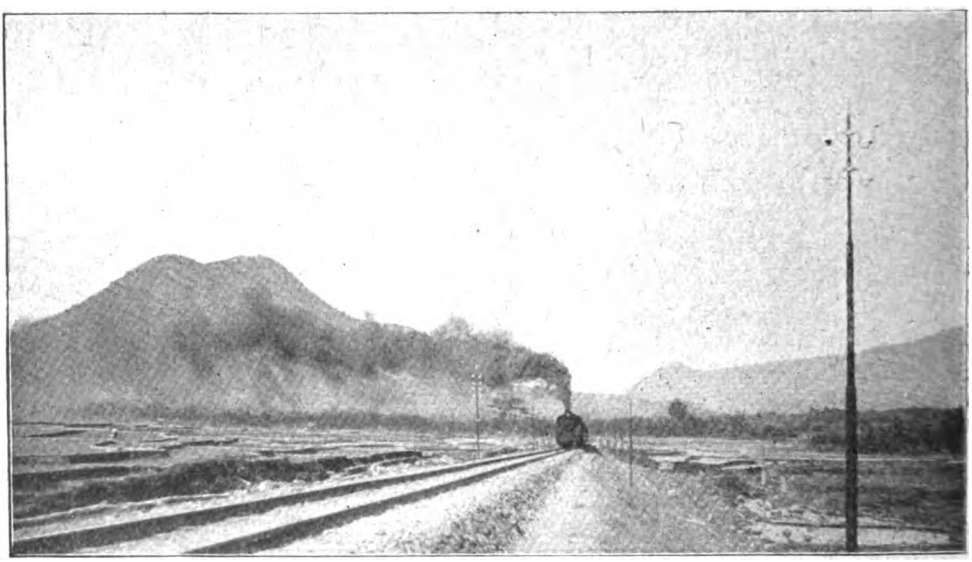
(2) *Narrow Gauge (S.V.) Engines.*

The principal type is a 2–6–2 tank engine built in 1908 at Amsterdam. They are used on the main line and also on the Djokja–Magelang tram line, which belongs to the N.I.S. They have a very high-pitched appearance.

(3) *Narrow Gauge (B.B.) Engines.*

These are of two main types. A 4–6–0 very similar to the 4–6–0 N.I.S. broad gauge engines, and used for heavy goods and mixed trains. The other type is a small 2–4–0 tank engine by Beyer Peacock & Co., built about 1898, which is used for the lighter fast passenger trains. In addition to these are, as in the case of the S.S., other tank engines for local work in the Batavia district.

Fuel employed is chiefly coal from Sumatra, and a little is also obtained from Australia, but a few of the engines (*e.g.*, No.



A MIXED TRAIN ON JAVA STATE RAILWAY.
The photograph illustrates the character of some of the country served by the line.

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641) burn wood, which is used a good deal in the East, where there are large tracts of forest country.

In regard to the carriages, the latest type employed on express trains are eight-wheeled corridor carriages. The first class only have cushions, the second class are similarly arranged to the first class, but, as a rule, with cane-bottomed seats; third class, wood. Seats are sometimes as in English carriages —facing and back to the engine—and sometimes with back to the window, as in a tramcar.

Some eight-wheelers have an open platform at the end instead of a corridor, but all trains are corridor trains in the sense that it is possible to pass from one end of the train to the other, thus providing a means of inspecting and collecting the tickets between stations, which is very disturbing to the passenger who is going some distance, the ticket collectors walking through all the carriages at least once after each station. All carriages are entered from the platform at the ends, there are no doors in the middle. Windows are provided with three separate frames which slide in grooves in the ordinary way. One contains glass as usual, one is a wooden sun-blind, and the other contains fine gauze, which keeps the coal dust and ashes out of the carriage, and yet does not shut out all the light and air.

On express trains dining cars are usually provided much like those used in Europe. They have eight wheels and weigh about 15 tons, the other eight-wheelers being about 12 tons.

There are plenty of old four-wheelers employed, the seats being arranged as in a tramcar. Special vans are provided for luggage. On the express trains these have eight wheels. For goods traffic the majority of trucks and wagons have four wheels, but there are a few eight-wheelers. The average load taken by four-wheelers is 8½ tons.

All couplings on the 3 ft. 6 in. gauge are of central and semi-automatic type, and there are no side buffers. On the broad gauge N.I.S. line from Djokja to Samarang, side buffers and ordinary screw couplings are employed.

The following lines have been projected in extension of the existing State Railways:—

(1) From Cheribon, south eastwards to join the main line at Kroja, about 15 miles east of Maos.

(2) Two short branch lines for about 20 miles in a northerly direction from Tjibatoe, and a point to the east of Bandoeng.

The former will thus provide an alternative main line from Batavia to the east, avoiding a good deal of the hill country, the only routes open now (excepting tramways) being the main line *viâ* Krawang and Bandoeng, and the route *viâ* Buitenzorg.

In Sumatra there are some railways in the Achin district in the north; a few short lines round Deli and Medan in the tobacco country in the north-east; and a line from the port of Padang in the south-west to Padang Pandjang, the Oembilin coal-field, and Fort de Kock in the hills, there being several sections of rack-rail in the latter part. Certain extensions are in progress here. Besides this, a line is projected from Palembang, in the south-east, to Telok Betoeng in the extreme south.

In conclusion, I must acknowledge the kindness of the State Railway authorities of Java for their kindness in supplying data and certain material used in the preparation of this article.

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.

Photo] [*F. E. Mackay.*

LANCASHIRE AND YORKSHIRE RAILWAY.
Southport Express leaving Manchester.
4–4–2 locomotive No. 1405.

A GLASGOW reader manifests some concern at having seen in Edinburgh for the first time several of the three-cylinder "Atlantics" of the North Eastern Railway, with outside cylinders driving the leading coupled axle—a practice which he thought to have entirely disappeared with the breaking up of various old 2–4–0 and 4–4–0 types of his acquaintance. After all, there is surely nothing very extraordinary in coupling outside cylinders to the leading pair of coupled wheels, seeing that, with very rare exceptions, every inside cylinder 4–4–0, 4–4–2 or 4–6–0 type drives on the leading coupled axle. But what my correspondent has in mind is that, with the advent of the "Atlantic" type of locomotive in this country, there commenced an era of outside cylinder propulsion, with its attendant advantage of being able to drive on the rear axle, and thus secure a longer connecting rod. This same advantage has been made use of also in the case of various 4–6–0 types. The later adoption of multi-cylinder driving arrangements, however, has put rather a different complexion on the matter.

In an engine having three or four high-pressure cylinders, a considerable simplification of the steam passages in the smoke-box is effected by keeping the cylinders in line. At the same time the utilisation of the leading axle only for driving purposes has a definite value in that the three or four connecting rods are then uniform in length, the motion details are practically the same throughout, and there is no inequality of weight in the revolving and reciprocating parts. Thus these parts more or less balance one another, and the result is a smooth-running locomotive. This explains the reason why the North Eastern three-cylinder "Atlantics" and the London and North Western four-cylinder 4–6–0 "Claughton" class engines have outside cylinders driving on the leading coupled axle. In the Great Western, the earlier London and South Western and the Great Southern and Western (Ireland) four-cylinder 4–6–0 types a certain uniformity of parts, together with connecting rods of rather greater length, has been secured by "stepping" the cylinders, *i.e.*, by placing the inside cylinders forward of the bogie centre-line and arranging them to drive the leading coupled axle, while the outside cylinders, in rear of the bogie centre-line, drive the middle pair of wheels. In the London and South Western 6 ft. 7 in. four-cylinder 4–6–0's, again, the cylinders are in line, but the connecting rods differ in length, as the driving arrangements are similar to those mentioned in the last sentence. The Lancashire and Yorkshire four-cylinder 4–6–0's have an internal arrangement entirely their own. It is difficult to say which of these methods affords the most satisfactory result; the "Claughton" arrangement is probably the most economical in its initial cost.

While speaking of the "Claughtons" and

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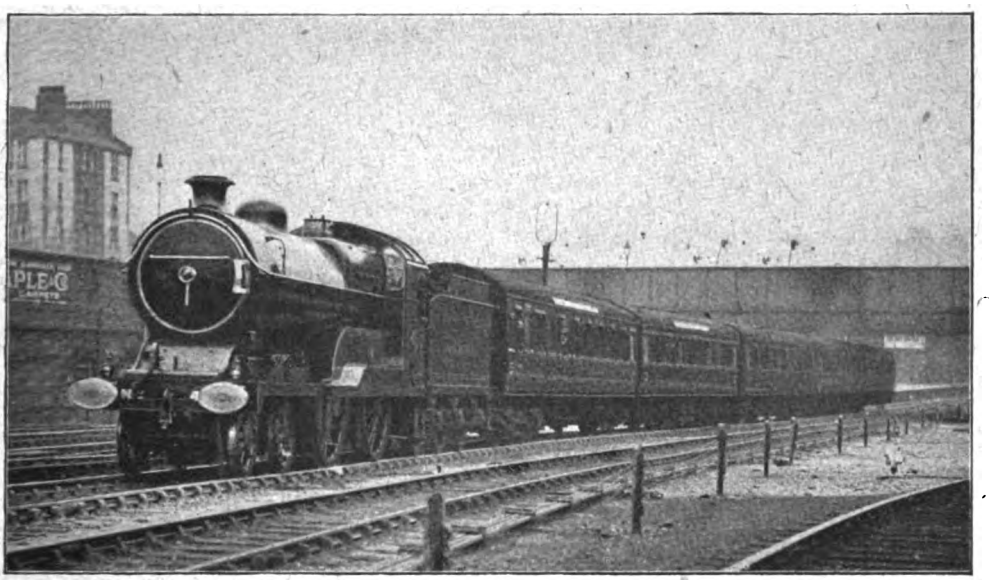
the Great Western Railway four-cylinder 4–6–0's, I am reminded of the query of a young enthusiast in a Lancashire college, which runs thus: "A friend of mine states that a few years ago in the competition between the London and North Western Railway and the Great Western Railway the Great Western Railway locomotive made a light job of the London and North Western Railway trains, while the London and North Western Railway locomotive could scarcely keep up a reputation of any sort with the Great Western Railway loads. If this is so, could you state the reason why?" Yes, this is a more or less accurate account of what took place, and it is the easiest task possible to explain "the reason why." The London and North Western engine *Worcestershire*, employed on these trials, was a non-superheater 4–6–0 of the "Experiment" class (this occurred in 1909, prior to the adoption of superheating by the London and North Western Company, and four years before the first "Claughton" had appeared), with two 19 in. by 26 in. cylinders, 1,898 sq. ft. of heating surface, 44¼ tons adhesion, and a working pressure of 175 lbs. per sq. in. Against this the Great Western 4–6–0 *Polar Star* had four cylinders 14½ in. by 26 in., 2,143 sq. ft. of heating surface, 55½ tons adhesion, and a working pressure of 225 lbs. per sq. in. *Worcestershire's* tractive effort, at 75 per cent. working pressure, therefore amounted to 16,420 lbs., and *Polar Star's* to 22,920 lbs. Further comment is needless. But it has always been a mystery to me that the London and North Western authorities could have expected a locomotive of such manifestly inferior steaming and tractive power to attempt to compete on level terms with the Great Western engine. A competition between a Great Western 4–6–0 4-cylinder "Princess" and a London and North Western "Claughton," with four cylinders 15¾ in. by 26 in., 2,232 sq. ft. of heating surface, 180 lbs. per sq. in. pressure, 59 tons adhesion, and a tractive effort of 21,500 lbs., should, judging by the respective performances of the two types already recorded, prove a much more "sporting" event.



Photo] [*F. E. Mackay.*

GREAT CENTRAL RAILWAY.

3.15 p.m. Sheffield and Manchester express leaving Marylebone.

The next question asked is really an old and familiar friend. "On a double-headed train which engine pulls the most?" queries an anxious student of the eternal piloting problem. The answer to this is obviously that it depends entirely on the particular circumstances. Where the two engines differ considerably in their hauling capacity, the work they perform, all other conditions being equal, will be in proportion to their respective tractive powers. The position they occupy

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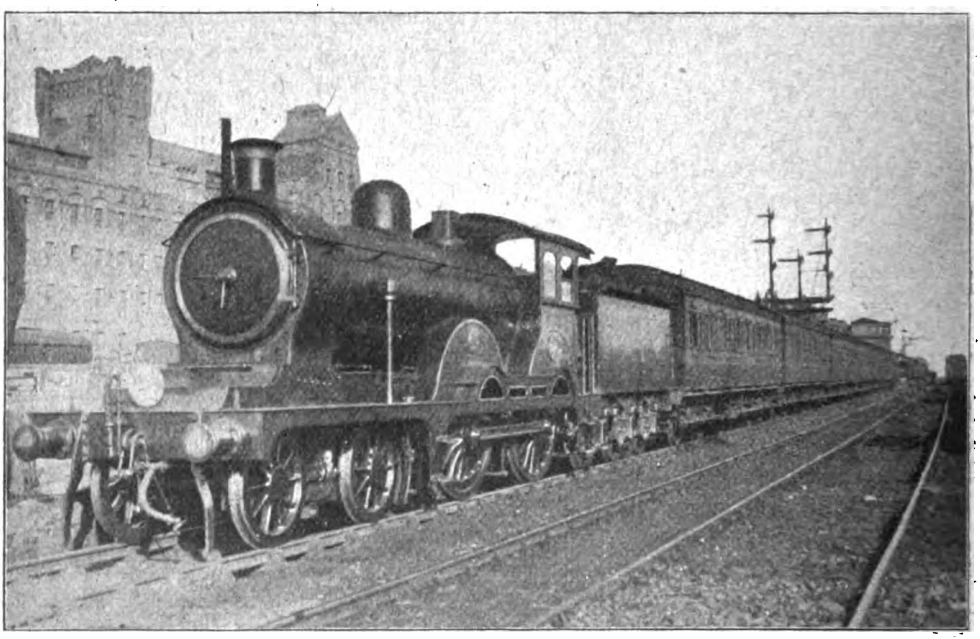
relatively to each other at the head of the train, *i.e.*, the fact whether the more powerful engine is the pilot or the train engine, should not make the slightest difference. One is so often asked whether, if the bigger engine is, say, next the train, it is not pushing the leading engine in addition to pulling the train. To which the answer is that, if this were really the case, the pilot would be a great deal better dispensed with, seeing that it would be adding to the train engine's work rather than lightening it.

This query is, of course, absurd. The only condition under which it would be possible for one of the two engines of a piloted train to push or pull the other in addition to its work of hauling the train would be if the latter were no longer developing enough power to overcome its own internal resistances. Such a state of things is possible, but probably is of extremely rare occurrence. If, for example, an engine with very small driving wheels were piloting a large-wheeled engine over a line with a falling gradient, it is possible that so high a speed might be attained that all the tractive power of the smaller engine would be more than consumed in moving itself at this rate. Thus the couplings between the two engines would become slack, and the condition mentioned in the last paragraph would come into being. Or, if the more powerful engine were leading on such an occasion, it would require to haul a proportion of the weight of the smaller engine in addition to that of the train. Gross inequality of driving might, in an extreme case, produce the same result, but one can hardly imagine any driver acting so meanly as to throw part of the weight of his own engine on to the other driver as well as the train weight.

The ethics of piloting are best understood by a simple algebraic formula which I once gave in these columns in answer to this self-same query. Let us suppose that the pilot exerts a total tractive effort of a tons, of which x tons are expended in moving itself, and that the corresponding figures in the case of the train engine are b and y respectively. Thus the pilot has $a-x$ tons effort available for the haulage of the train and the train engine $b-y$ tons. The total force exerted on the train is therefore $(a-x)+(b-y)$ tons. Now, obviously, it is quite immaterial whether $a-x$ be greater or less than $b-y$. So long as each engine is exerting more than sufficient effort to move itself—as must obtain in all but the rarest cases—it will neither pull nor be pulled by the other. So the question as to which of the two engines



Photo] [*W. H. C. Kelland.*

GREAT EASTERN RAILWAY.
4-4-0 locomotive, No. 1861, on up "slow" at Cambridge.

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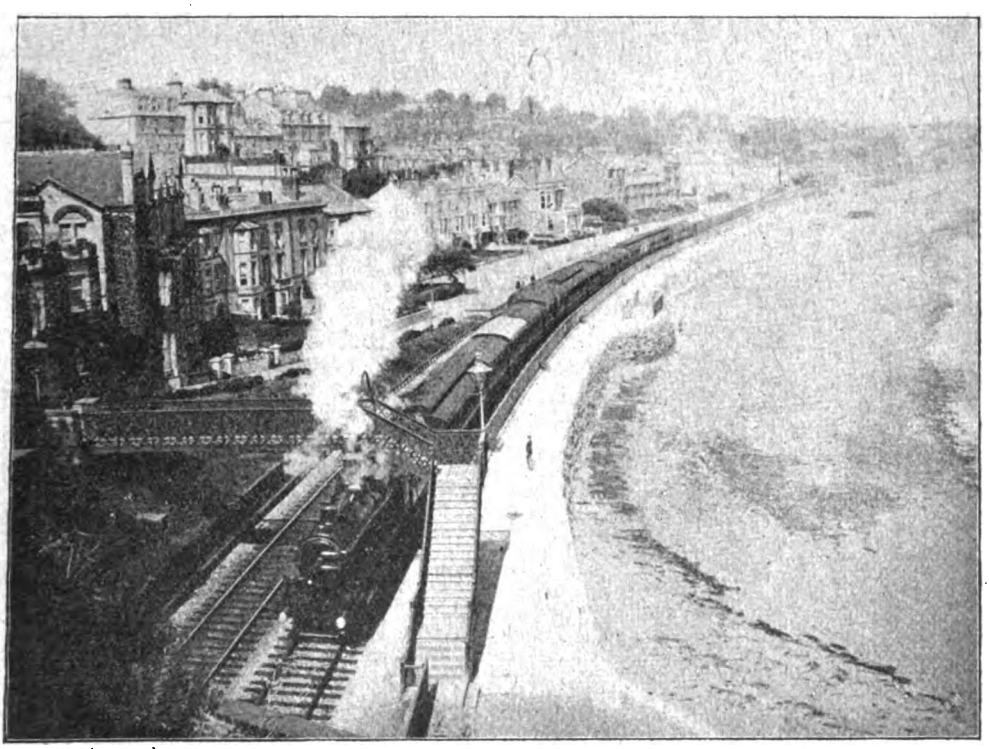
of a piloted train "pulls the most" is decided by its tractive capacity relatively to the other, and not by its position relatively to the other at the head of the train.

Yet two further letters have reached me concerning methods employed in timing, and they are quite worth quoting. Referring to my remarks in the July issue, relative to the accuracy of an ordinary watch, the first correspondent writes: "It has always seemed to me that the second hand of a watch must be accurate for the following reasons. In the first place, it ought to travel at exactly 60 times the speed of the minute hand, and the minute hand at 12 times that of the hour hand; this result is obtained simply by giving the right ratio to the gear teeth employed in the watch. It seems unthinkable that a watch should be so badly designed as not to give this right ratio, and once it is so made it cannot alter. Therefore, supposing that the watch is keeping good time, the hour hand takes 12 hours for revolution, the minute hand 60 minutes, and the second hand 60 seconds, exactly. In the second place, the minute divisions on the dial are presumably marked by eye, and are probably not absolutely accurate. Further, a tilting of the watch will cause the minute hand to appear in a different position to what it would appear if looked at from another angle, as there is a considerable clearance between the minute hand and the dial (the minute hand being on top of the hour hand). So, when I have once noted the relative positions of the minute and the second hand, I assume this to be correct, and if the minute hand appears later to disagree with the second hand, I take it to be due to the inaccurate marking of the minute divisions or to the watch being tilted. But it always agrees again with the first observation later on."



Photo] [*F. H. Stingemore.*

GREAT WESTERN RAILWAY.

Down train approaching Lea Mount Tunnel, Dawlish.

The other letter raises a different point altogether. "The method of timing you quote in the July issue," says the writer, "seems to me not only laborious but also inaccurate, and drops into just the pitfall it

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seeks to avoid with respect to any discrepancy between minute and second hands. In my own watch and one or two others that I have tried, it is the second hand which reads correctly and the minute hand incorrectly, owing to inaccurate centreing of the dial. In an ordinary watch in which the length of the minute division is 1–10-in. or thereabouts, if the dial is set 1–50-in. low, the minute hand will read 12 seconds low at about a quarter past the hour, and 12 seconds high at a quarter to, if it is set right at the hour. And certainly I would never trust myself to be sure to 5 seconds when the minute hand exactly coincides with the minute division, even if the minute hand were touching the dial." As I mentioned in commenting on the method of timing referred to in the July article, this possibility of error in spotting the point of "coincidence" is undoubtedly the fatal flaw in the method.

Proceeding, my correspondent writes: "At one time it was necessary for me to make a good many experiments on the magnitude of the personal error in timing, and also its variation. The figures given below are the averages of a large number of experiments made with watches reading to 1–50-sec.:—

Observation by sound:

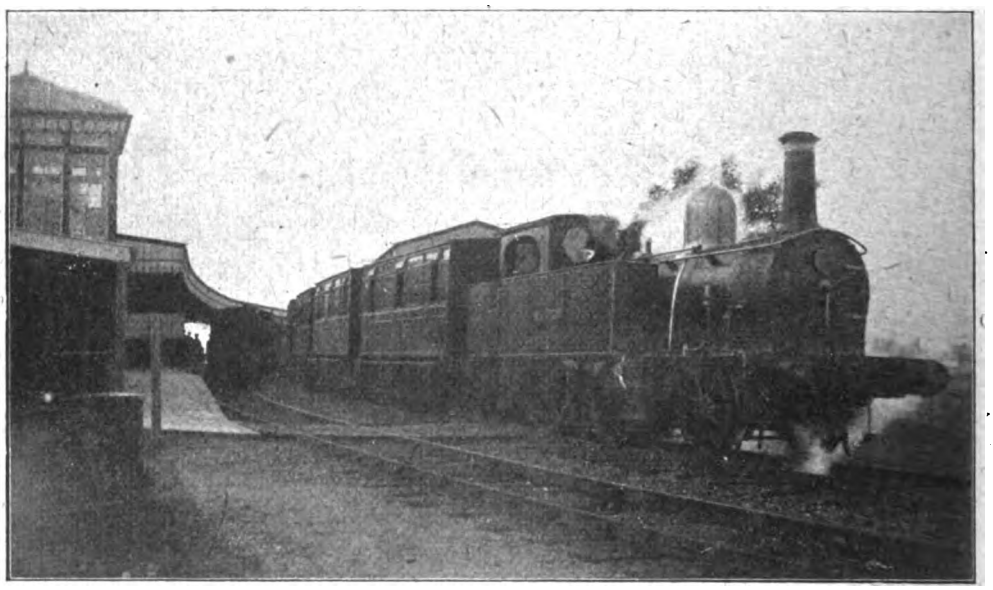
Average personal error	0.21 sec.
Average variation of error	From—0.07 to + 0.07 sec.

Observation by sight:

Average personal error	0.17 sec.
Average variation of error	From—0.04 to + 0.04 sec.

All these four quantities decreased with practice, and since it is only the variation of the personal error that matters in train timing, the probable error appears to be negligible when timing is done to 1–5-sec. In timing rail-joints with a stop-watch, by the way, I find that, knowing exactly when the sound I want to time is coming, I have a tendency to press the knob early. I have noticed the same difficulty in timing a swinging pendulum, but some observers appear to experience no trouble in this respect."

"In timing mile-posts with an ordinary second hand, I find it a great help to get an idea when the next mile-post will appear, to 5sec. or so"—that is where practice in reckoning distances by means of rail-joints becomes so valuable an adjunct to chronograph readings from mile-posts, in enabling the location of the next post to be exactly fixed by the observer—"so that I can turn my



Photo] [*F. H. Stingemore.*

ISLE OF WIGHT RAILWAY.

Train at Ryde Esplanade station.

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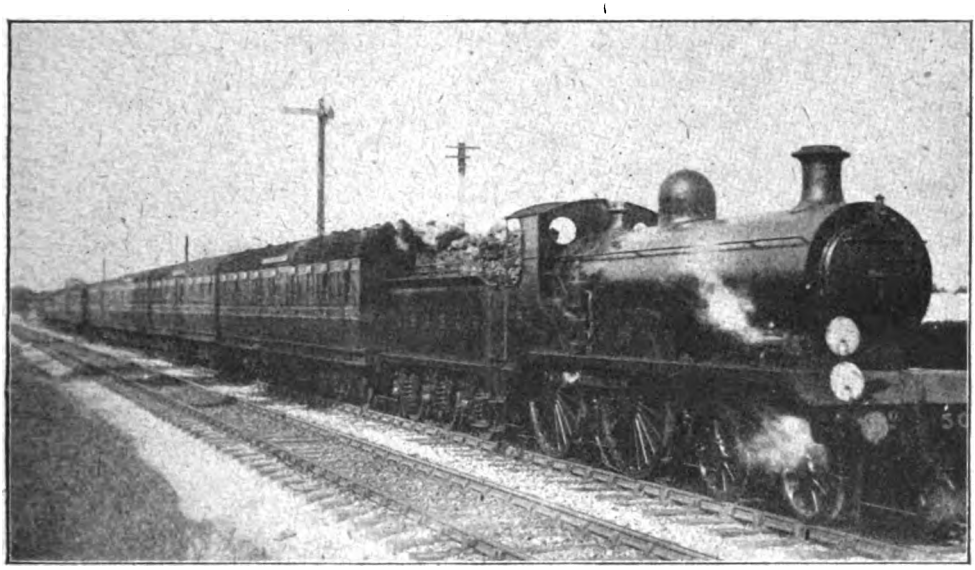
eyes directly to the correct part of the seconds dial; otherwise I should only sometimes do so, and should sometimes drop a second or so in seeing at what part of the dial the hand was. In that way I think I am able to keep down the variation in personal error, and assuming that I am correct to the nearest second, timing a mile with a second hand should be hardly less accurate than timing ¼-mile with a 1–5-sec. stop-watch, unless the speed is changing rapidly." Agreed, provided that the observer applies himself sufficiently closely to his work, which is not always a foregone conclusion. Further, the proviso as to the rapid changing of speed in my experience considerably limits the accurate application of this method.

Concluding, the writer remarks: "The method of counting ticks of an ordinary watch should be all right, I think, for mile-post timings for a short time, but would surely be very tiring to keep up for long; and would it not be a little confusing to keep on counting and at the same time to write down the observation for the last ¼-mile?" Probably it would, but I have no doubt that the intention of the originator of this method was to apply it to alternate ¼-miles only. Little further requires to be added to these interesting letters. The virtue of a discussion of this character is that it brings to light the varying methods adopted by different observers, and so makes for increased attention to the important subject of accuracy in observation, which was the starting point of the discussion. Further, it appears indisputable from the correspondence that the vast majority of the recorders of locomotive performance read their station passing times from the ordinary minute and second hands of their watches, the use of the centre-second hand or the independent chronograph by those that possess either being confined mainly to mile-post or rail-joint readings.

"Performance" is, I fear, a little belated this month, and must be correspondingly curtailed. A Darlington reader writes to ask for some details of runs on the North Eastern Railway between Newcastle and Edinburgh. "I have eleven RAILWAY MAGAZINES," he adds, "containing particulars of performance *south* of Darlington, but none with the work on the northern section discussed." This is correct, but had my friend's records gone back a year further, he would have found in the November issue of 1912 a complete article with tables devoted to work over that portion of the East Coast route. The down runs described were principally on the train of which he makes special mention—the late 11.14 a.m. express from Newcastle to Edinburgh, now leaving at 11.23 a.m., and allowed 147 min. instead of 138 min. for the 124½ miles' journey.



Photo] [*T. B. Welch.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Worthing–London express. 4–4–0 locomotive, No. 50, as rebuilt.

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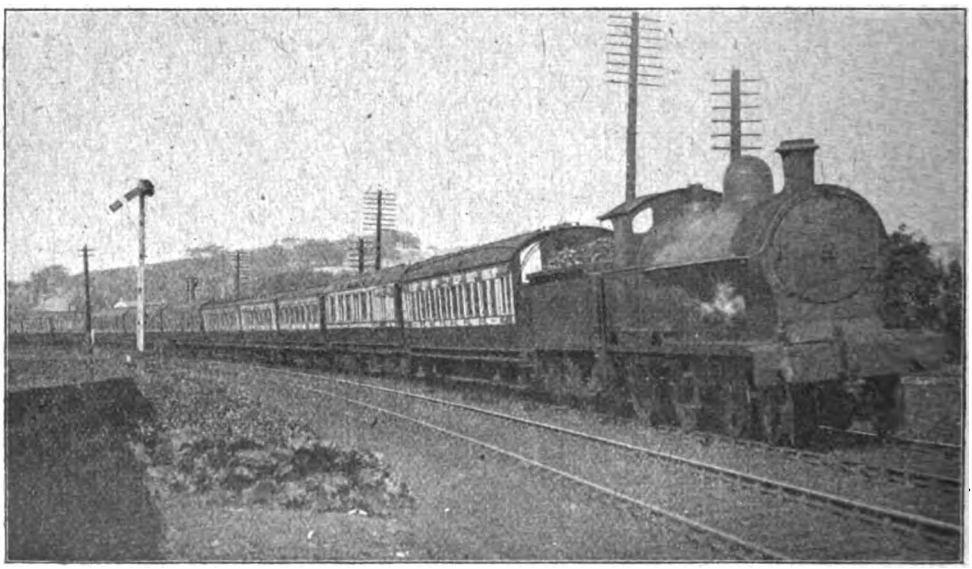
Since then I must confess that I have not been so fortunate as regards my runs on the train in question, and this probably explains any "neglect" of this particular section during past months, but I agree that it is high time that it should now receive a little attention.

First let me give a very brief *résumé* of the gradients.. The principal summit points between Newcastle and Berwick are Cramlington, 10 miles, and Little Mill, 39 miles from Newcastle. To the former the ascent is confined mainly to a 3-mile stretch from the Manors station, mostly at 1 in 200, known as Benton bank, and a further 1½ miles at 1 in 224 from Annitsford, with an intervening level strip; the descent extends as far as Longhirst, 20 miles from Newcastle, but is much broken, being steepest for 1½ miles at 1 in 217 from Plessey, and for some 5 miles past Morpeth, where a severe service slack is in force. Thence ensue slight undulations to a point 2 miles before Alnmouth Junction, a 2-miles' drop at 1 in 220–264 past that station, and the 4 miles' ascent at 1 in 170—Longhoughton bank—which leads to Little Mill. After 1¾ undulating miles we have the descending 3 miles at 1 in 150 of Christon bank, 9 miles fairly level to Craigmill, just beyond Belford, and a 3½ miles' fall at varying grades almost to sea-level. Another short level strip, and then comes Scremerston bank—3½ miles at 1 in 190—a drop into Tweedmouth, and a rise at 1 in 203 over the Royal Border Bridge into Berwick, where the speed restriction is 15 m.p.h. From there the start is very difficult, commencing with 4½ miles at 1 in 190 almost to Burnmouth, and continuing, after 3½ miles or so of easy grades, with Reston bank, nearly 8 miles long, of which a full 5¾ miles are at 1 in 200. This takes us to Grant's House, after which the famous Cockburnspath bank—¼-mile at 1 in 200, 4¼ at 1 in 96, and 1½ at 1 in 210, brings us quickly down to Innerwick, and then there are next to no grades worthy of mention until the final mile at 1 in 78 up into the Waverley station at Edinburgh.



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

10 a.m. Glasgow–Euston express passing Penrith, 4–4–0 locomotive, No. 1730, *Snipe.*

I have made five runs on the 11.14 a.m *ex*-Newcastle since last I wrote about this train; the engine was in all cases but one a three-cylinder "Atlantic," and the load was in three instances six corridor vehicles and a dining-car of the luxurious vestibuled stock provided by the North Eastern Railway for the Leeds–Glasgow service, together with an East Coast Joint Stock brake, while in the other two cases an extra third-class corridor was added. Taking first the lighter loads, which totalled 34 axles, 237 tons empty and 250 tons full, we find No.

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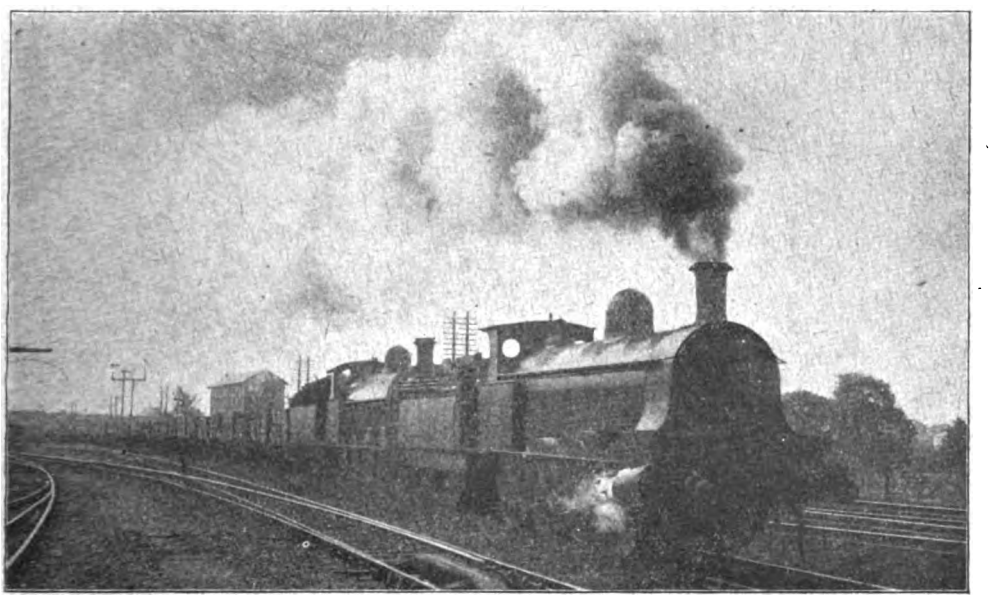
728 at the head of the train on two occasions. On the first we were through Cramlington, 9·9 miles, in 15 min. 25 sec., Morpeth, 16·6 miles, in 22 min. 20 sec., and had touched 66 m.p.h. at Longhirst when we were pulled up for relaying at Chevington. So it took 41¾ min. to get through Alnmouth Junction, 34·8 miles, and as the driver shut off steam on this short descent, we did not exceed 62½ m.p.h. at the viaduct, and fell to 43½ m.p.h. on Longhoughton bank. On Christon bank we did not exceed 71½ m.p.h., but at Smeafield we touched 74, and went up Scremerston bank at a minimum rate of 49. So we passed Belford, 51·6 miles, in 58 min. 50 sec., and and the last 3 miles into Waverley, under easy steam, in 5 min. 5 sec. The total journey time was thus 137 min. 55 sec.; or about 136 min. net, 5 min. having been regained from Belford in virtue of the good running on the later stages of the journey.

The second trip with No. 728 and the same load was by comparison a feeble effort, the immediate start alone being superior, as we were through Cramlington in 14 min. 55 sec.; and Morpeth in 22 min. 5 sec. Then followed a very bad check again near Chevington, so that we took 43 min. 50 sec. to the last-mentioned point. After this the running was leisurely to a degree, as we fell to 43 m.p.h.



Photo] [*J. Macartney Robbins.*

LONDON AND NORTH WESTERN RAILWAY.

0–8–0 Compound, No. 1226, with 0–8–0 superheater locomotive on a down empty coal truck train at Sudbury Junction.

Berwick, 66·9 miles, in 73 min. 50 sec. After slacking through the Border Town we only attained 38 m.p.h. on Burnmouth bank, but did better on Reston bank, not falling below 47½, and accelerating to 50 before passing Grant's House. So Burnmouth, 5·5 miles from Berwick, was passed in 9¾ min., and the remaining 10·7 miles up to Grant's House took 11¾ min. After that we went moderately down Cockburnspath bank, not exceeding 72½ m.p.h., and then slacking, but we covered the 12 miles from Grant's House to Dunbar in 11 min. 20 sec.; the 11·5 miles from Dunbar to Drem in 11 min.; the 14·8 miles thence to Portobello in 15 min. 10 sec.; on Longhoughton bank, only touched 70½ on Christon bank, and were content with a beggarly 60 beyond Belford, the time to the latter station being 61 min. 20 sec., and to Berwick 77 min. 20 sec. From Berwick to Edinburgh we just managed to keep time, taking 22 min. 40 sec. up to Grant's House, 12 min. 20 sec. thence to Dunbar, and 32 min. from Dunbar into Waverley, where we arrived 14 min. late, having lost 6 min. 20 sec. from Newcastle. Only the 3 min. and the odd seconds were attributable to the check, leaving a net loss of 3 min. against the engine, despite the comparative lightness of the load.

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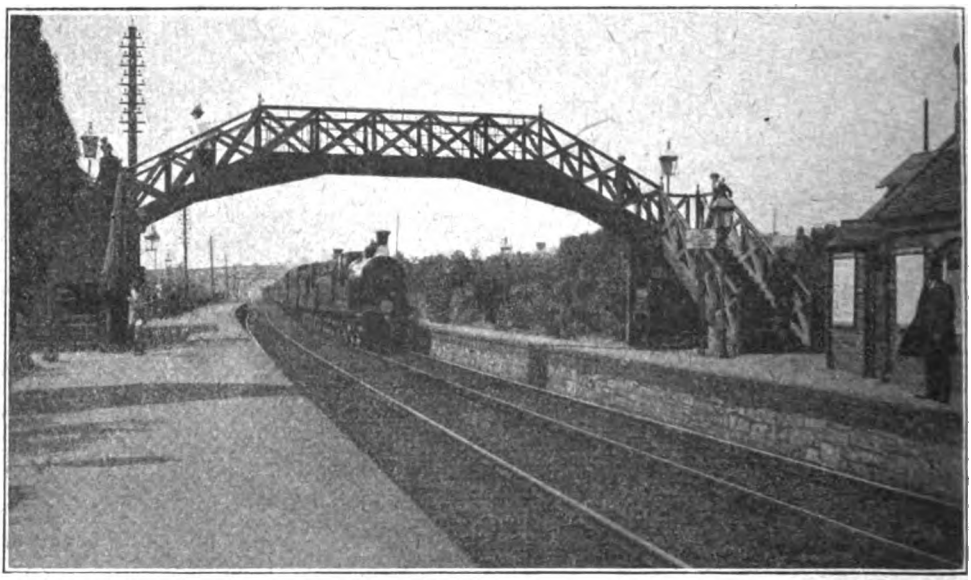
On the third trip, again with 250 tons, we did very far better, the engine being No. 730, one of the two well-known Smith four-cylinder compound "Atlantics." This engine has since been superheated, but had not been so dealt with when this run was made. Despite slipping at the start, we were through Cramlington in 14 min. 40 sec., and although slowed for permanent way repairs beyond Plessey, Morpeth was breasted in 21 min. 40 sec. The usual permanent way check occurred in the neighbourhood of Chevington, so that it took us 41¾ min. to get through Alnmouth Junction, but we were doing 69 m.p.h. before crossing the viaduct. 10 min. 35 sec.; and from Drem to Inveresk, 11·3 miles, in 10½ min. (total, 34·8 miles in 32 min. 10 sec.); but checks over the last part of the journey caused the 6·5 miles from Inveresk into Waverley to consume 9 min. 35 sec. Unchecked at the finish we should have completed the journey 135 min. from Newcastle; actually our time was 136½ min. (1½ min. under schedule); the net time for the 124½ miles was certainly not over 131 or 132 min. So No. 730 acquitted herself excellently.

Of the 38-axle loads, totalling 280 tons, the first was taken by No. 729, superheater three-cylinder 4–4–2, and for the major part



Photo] [*A. W. Wilkins.*

LONDON AND SOUTH WESTERN RAILWAY.

12 noon express train Exeter to London (Waterloo) passing through Pinhoe station.

Of the minimum up Longhoughton bank I have no record, although I noted with some astonishment the application of brakes down Christon bank, so that we did not do more than 72½ m.p.h. here and 70 beyond Belford. But we were through Belford in 57 min. 50 sec. and Berwick in 73½ min., having only lost 2½ min. to this point. Beyond Berwick there was some fine running. Accelerating to 43 m.p.h. up the 1 in 190, we ran from Berwick to Burnmouth in 9¼ min., and from Burnmouth to Grant's House in 12 min. Then we touched 76½ m.p.h. on Cockburnspath bank and again 72½ through Dunbar, running from Grant's House to Dunbar in 11 min. 5 sec.; from Dunbar to Drem in of the journey the running was magnificent. The start was slow, and was further hindered by a slack of exceptional severity at Killingworth, to 5 m.p.h., which made us take 24¼ min. to get through Morpeth. But then we maintained a level 64–66 m.p.h. to Alnmouth Junction, touched 68 beyond, went up to Little Mill with no lower rate than 52½, sustained 75 m.p.h. both down Christon bank and beyond Smeafield, and breasted Scremerston bank at a minimum of 51 m.p.h. —a sequence of fine records with a substantial load. So the 18·2 miles from Morpeth to Alnmouth Junction occupied 18¼ min.; the 16·8 miles thence to Belford 16 min.; the 14·1 miles, Belford to

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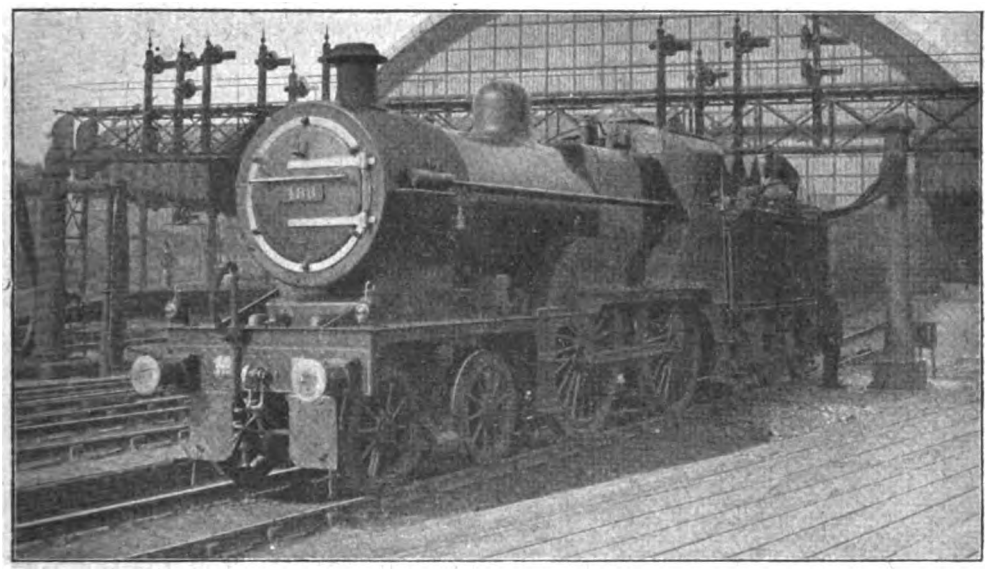
Tweedmouth, 13 min. 20 sec. (total, 49·1 miles of very undulating road in 47 min. 35 sec.); and we were through Berwick in 73 min. 25 sec. We did not do exceptionally on the 1 in 190 up to Burnmouth, not accelerating above 39½ m.p.h., but touched 60 beyond Ayton, and went up to Grant's House with no lower rate than 45 m.p.h. So the Berwick–Burnmouth time was 9 min. 25 sec., and the Burnmouth–Grant's House time 12 min. 40 sec. Similarly the descent to Dunbar was brisk, touching 76½ m.p.h. and occupying only 11 min. 10 sec. But after that a terrible declension set in, as the last 29·3 miles into Edinburgh, quite unchecked, took no less than 32 min. 50 sec., as against the net time of 29¼ min. on the last run. So we actually took 139 min. 40 sec. on the journey, but could easily have arrived in 136 min., or a little over, had the driver so chosen: the net time was about 137 min., or slightly under. We reached Edinburgh 16 min. late.

The last 280-ton journey, behind "Atlantic" No. 720 of the same type, reproduced almost exactly the features of the run just described. We were through Cramlington in 14 min. 50 sec., Morpeth in 21 min. 50 sec., and had attained 67 m.p.h. before being pulled up at Chevington for relaying. Nevertheless, we passed Alnmouth Junction in the good time of 40¾ min., travelling at 69 m.p.h., did not fall below 45 at Little Mill, and touched 72½ on Christon bank and near Smeafield, getting through Belford in 57 min. 25 sec., and Berwick in 73 min. 10 sec. After that also we did well to attain 41½ m.p.h. on Burnmouth bank and 62½ at Reston, the times of 8 min. 55 sec. from Berwick to Burnmouth and 12 min. 5 sec. from Burnmouth to Grant's House being quite brilliant with this load. But after this we went all to pieces again, taking 11¾ min. from Grant's House to Dunbar and no less than 35 min. 5 sec. thence to Edinburgh. That is to say, we lost over 6½ min. on the times made by No. 730 between Grant's House and Edinburgh. So the total journey time was 141 min., instead of, as it might have been easily, 135 min., and we arrived 8 min. late. Even the net time was 139 min., or a minute over schedule, which under the circumstances outlined was not a very satisfactory record.



Photo] [*P. F. Cooke.*

MIDLAND RAILWAY.

Rebuilt and superheated 4–4–0 locomotive, No. 488, taking water at Manchester Central station.

I have had also a number of return journeys, but mention of these must be limited to the very briefest. They were not of such interest as the runs in the forward direction, as the timings are fairly easy: further than this, most of the runs on the 2.20 p.m. *ex*-Edinburgh were piloted, despite the moderate character of the loads. But I will begin with three trips on the 6.25 p.m. up—the return working of the train which we have already had under consideration.

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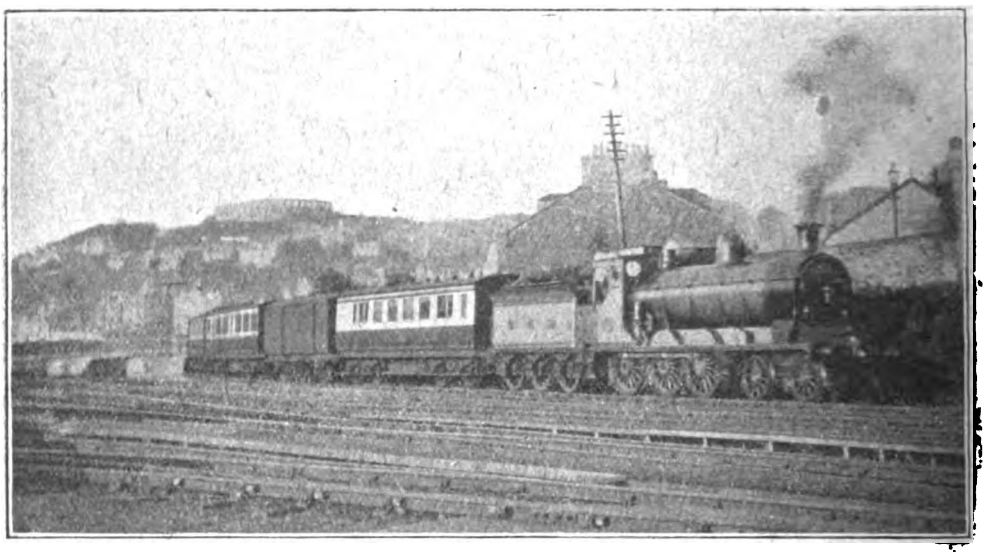
On the first run, No. 709, three-cylinder 4–4–2, had a load of 8 "eights" and a 12-wheeled dining car, totalling 270 tons with passengers, and made light of it. The start, indeed, was exceedingly rapid, as we were through Portobello, 3 miles, in 5 min. 20 sec.; Drem, 17·8 miles, in 20 min. 50 sec.; Dunbar, 29·3 miles, in 31 min. 20 sec.; and Innerwick, 33·8 miles, in 36 min., passing Dunbar at 71½ m.p.h., over 4½ min. before time. But this haste was employed to balance a veritable crawl up Cockburnspath bank, with a minimum of 19 m.p.h.! So we took 49 min. 40 sec. to pass Grant's House, 41·3 miles, but by covering the 16·2 miles on to Berwick stop in 17½ min., with a maximum of 74 m.p.h. near Ayton, and a very cautious descent from Burnmouth, we completed the first stage of 57·5 miles in 67 min. 10 sec., instead of the 71 min. allowed. After waiting a modest 12 min. for "time" at Berwick, we ran very moderately thence to Newcastle, as usual, taking 18 min. 40 sec. to Belford (15·3 miles), 37 min. 10 sec. to Alnmouth Junction (32·1 miles), 57 min. 20 sec. to Morpeth (50·3 miles), and 80¼ min. to Newcastle (66·9 miles), the booking being 79 min. Adherence to schedule was close throughout, the loss of time occurring by reason of a slight permanent way check at Heaton.

On a subsequent run, No. 718, of the same class, had an extra bogie corridor on, increasing the load to 42 axles, or 300 tons. We were very sluggish at the start, taking 6 min. 20 sec. to Portobello, 24 min. 50 sec. to Drem, 36 min. 25 sec. to Dunbar, and 54 min. 25 sec. to Grant's House, with a minimum of 22 m.p.h. on the ascent, but a brisk descent to Berwick in 16 min. 40 sec., with a maximum rate of 71½ m.p.h. beyond Burnmouth, just retrieved the situation, and we stopped in 71 min. 5 sec. from Edinburgh. The second stage was run rather poorly, as we passed Belford in 19 min. 20 sec., Alnmouth Junction in 39 min., and Morpeth in 58 min. 50 sec. (we had now lost 2 min.), and with a signal check on Benton bank we took 82 min. 10 sec. to Newcastle, arriving over 3 min. late. Net time was about 80½ min. No. 732, superheater "Atlantic," had on the third journey a still heavier load, of 45 axles, or 305 tons, and again the running was undistinguished to Berwick, and feeble thereafter. We took 5½ min. from Waverley to Portobello, 23 min. 10 sec. to Drem, 34 min. 40 sec. to Dunbar, 52½ min. to Grant's House (the lowest speed of ascent was 24 m.p.h. this time), and 70½ min. to Berwick. From there we passed Belford in 20 min., fell to the hardly sensational minimum of 35 m.p.h. on Christon bank, ran through Alnmouth Junction in 40¼ min. (3¼ min. late), Morpeth in 59 min. 25 sec.,



Photo] [*Cecil J. Allen.*

CALEDONIAN RAILWAY.

Glasgow train leaving Oban, 4–6–0 (5 ft.) engine, No. 52.

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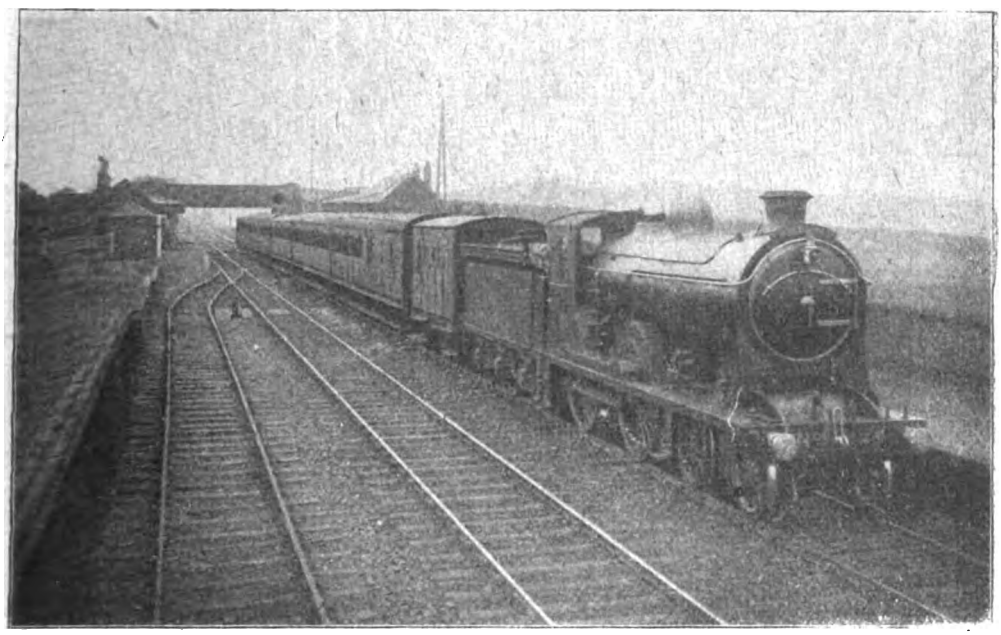
and reached Newcastle in 81 min., having made up a little time from Alnmouth Junction, but suffered a bad check after Manors, or 80 min. net. It is curious how almost invariably in my experience the work on this train south of Berwick has been unworthy of note, especially as it is more liberally timed here than the heavier 10.0 a.m. and 2.20 p.m. *ex*-Edinburgh.

Of my runs on the last-mentioned train, only two unpiloted trips are of much interest. On the first we had a 4–4–0, No. 592, class R, and 42 axles, or 295 tons. We suffered a bad permanent way check at Abbeyhill at East Fortune (it is possible that this was occasioned by brakes "leaking on," or some other trouble) and 23½ m.p.h. on Cockburnspath bank. So we took 54 min. 10 sec. to Grant's House, but with fast running beyond, touching 72½ m.p.h. at Ayton and 69 beyond Burnmouth, we were into Berwick in 70 min. 35 sec. After that we did quite well, attaining 70 m.p.h. before Beal, which was passed in 10 min. 20 sec. (8·3 miles), and passing Belford in 17 min. 10 sec. and Alnmouth Junction in 34¾ min.—a smart time for 32·1 miles' journey. Then came a permanent way slack at Chevington, so that we took 56 min.



Photo] [*Frank Bell.*

NORTHBRITISH RAILWAY.

4.37 p.m. Clydebank East to Edinburgh (*vid* Bathgate) at Forrestfield.
4–4–0 superheater locomotive, No. 424, *Lady Rowena*.

Junction, and another at East Linton, so taking 39 min. 25 sec. to Dunbar, 57¾ min. to Grant's House, and 75 min. 20 sec. to Berwick. But, cutting short the stop there, we got away on time, passed Belford in 19 min. 20 sec., Alnmouth Junction in 37 min. 40 sec. (at 70 m.p.h.), Morpeth in 57 min. 5 sec., and reached Newcastle only 35 sec. behind time, in 78 min. 35 sec. from Berwick. Subsequently, No. 2193, one of the latest Z class "Atlantics," had a 40-axle load, or 290 tons, behind the tender, and travelled out with most unaccountable feebleness to Berwick, speed actually falling to 38 m.p.h. 10 sec. to Morpeth, but for all that we reached Newcastle nearly a minute early, in 77 min. 10 sec. from Berwick, the net time not exceeding 75 min. for the 66·9 miles. This was quite a good run. The piloted runs are not worth the waste of space involved in their description, as in no case—despite the vast combination in certain instances of two of the latest Z class three-cylinder superheater "Atlantics" at the head of the train — was any exceptional work performed, or any attempt made to do other than adhere closely to schedule times.

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A Notable Railway Career.

MR. DAVID COOPER, GENERAL MANAGER, GLASGOW AND SOUTH WESTERN RAILWAY.

WHEN the romantic story of Scottish railway construction and development in the last quarter of the nineteenth century, and in the opening years of the twentieth, is written, no name will stand out in bolder relief among the names of the small group of men indissolubly linked with successful railway enterprise and the industrial growth of Scotland than that of Mr. David Cooper, General Manager of the Glasgow and South Western Railway, who on September 2nd completes fifty years of active and unbroken service with that Company. Mr. Cooper's record is unique in railway annals, and few other men alive or dead can, we believe, parallel it.

One finds Mr. Cooper in 1867, a young lad, just after quitting the parish school for good, as Parcels Clerk at Waterside station, Dalmellington. There, metaphorically, he stood at the foot of the mountain, and to the boy the ascent seemed steep and the road strewn with boulders. He has been always eminent for the exercise of plain common sense, and back even in those early days he seemed to have gripped with an iron grip the eternal truth that to desire is to obtain, to aspire is to achieve, and he scaled the mountain from base to summit. Years ago he stood upon its topmost peak—proud, but not exultant—proud that he "held on" until he had reached the goal towards which he had set out from the little railway station in Ayrshire. Mr. Cooper has been one of the most successful chief executive railway officials that Scotland has known; pre-eminently a man of the time, into whose strenuous and earnest life the factors of luck and chance have never entered. If you examine the career almost microscopically, you will find that persistent, unfaltering effort and result are the dominant notes that ring true throughout those fifty years of hard work.

To describe in detail Mr. Cooper's fifty years' connection with the Glasgow and South Western would embrace the outstanding facts of railway growth and expansion in the West of Scotland during that progressive period. It will be obvious, therefore, that within the compass of an article such as this must necessarily be, the barest outline can only be given of the main incidents in all his career. But even in outline the life story of such a man is stimulating and suggestive, and demonstrates the possibilities within the reach of the young man setting out on the life journey, determined that whoever may be found in the field of defeat he will not be among the number. The writer once heard Andrew Carnegie say that he would not give a fig for the young man in business who did not already see himself a partner, or at the head of an important firm. "A young man," said the millionaire, "should not rest for a moment, in his thoughts, as a head clerk or a foreman in any concern, no matter how extensive. He must say to himself, 'my place is at the head,' and he must vow to himself that he would reach that position with untarnished reputation, and he must make no other vows to distract his attention." Than Mr. David Cooper, no better illustration could be cited of the Carnegie gospel; he, in the most literal sense, rose step by step, and when the topmost notch in the scale was reached the reputation was not only untarnished and unblemished, but stood out stronger and more transparent than ever it did. Power is a fine test of real strength; the weak, unsubstantial man abuses it, the strong man uses it in spite of himself as proof that he is a genuine man in the highest and best sense. "The man's the gow'd for a' that," whether you find him struggling in defeat or victorious in success. Mr. David Cooper has never been known to abuse the power with which he became possessed; the greater the power the stronger and the clearer did the true character of the man disclose itself.

A noteworthy fact that may be incidentally referred to here is that during his tenure of office as Chief Executive Officer there has been less labour unrest in the Glasgow and

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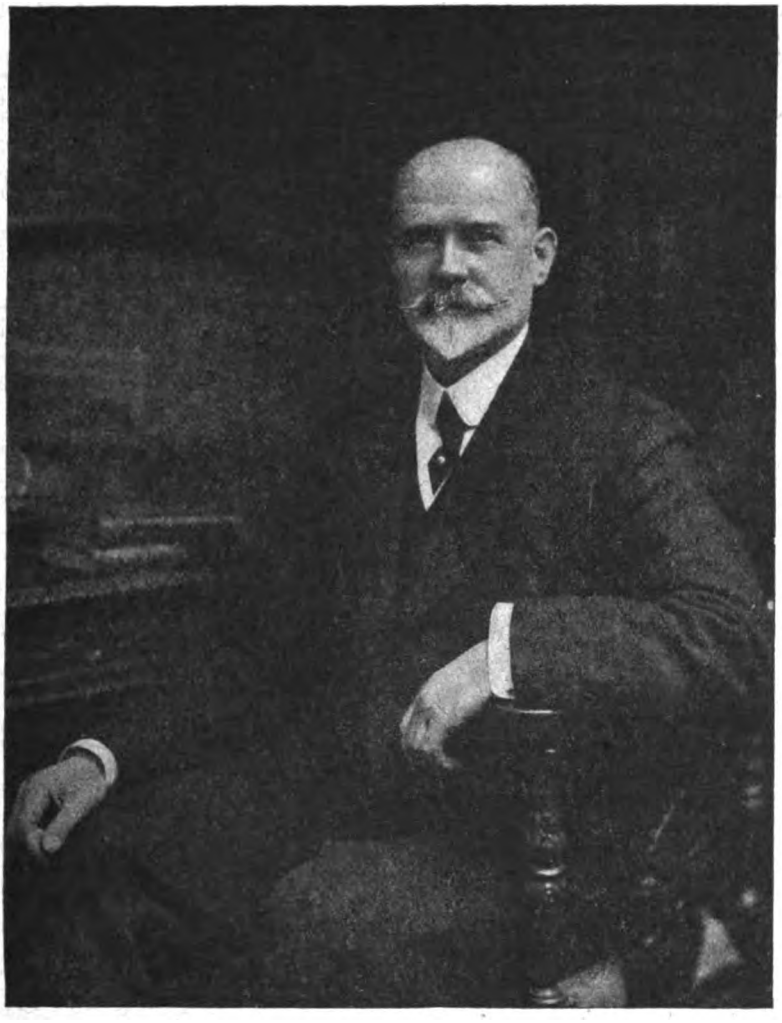

MR. DAVID COOPER,

General Manager,

Glasgow and South Western Railway.

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South Western than on any other railway in the United Kingdom. Strikes in the usual meaning have been practically unknown. The immunity, it is quite safe to say, has been largely due to the fact that the General Manager is himself sprung from the people, and that no man knows better than he does the hopes and the aspirations of the toilers. On the Glasgow and South Western Railway no man with a genuine grievance ever appeals in vain to Mr. Cooper. He always receives a patient hearing and redress when he makes good his plea.

Mr. Cooper is an out-and-out Ayrshire man, and of the sturdy, unconquerable race which sent forth, to spread joy and happiness among the sons of men, the greatest singer of his own or of any age—the immortal Robert Burns. He was born in the village of Waterside, Dalmellington, educated under the tuition of the late Mr. Donald Ross, at the local school, where he was not only "dux," but won from amongst his youthful competitors "the grand prix" in the shape of a medal presented by Mr. Houldsworth, of Coltness, for General Knowledge. After leaving school he joined, in 1867, the Glasgow and South Western Railway as Parcels Clerk at Waterside; subsequently he went to Maybole, where he remained three years. It must have been while he was here that he began to show those fine gifts which soon marked him out as being made of stuff which raised him above the common ruck of young men of his day. At any rate, we find him in 1872 filling an important appointment in the Superintendent's Office, which was the first real step in the unbroken series of successes which culminated in his present office. Having served there first under Mr. Gilmour and later under Mr. Mathieson, he acquired a thorough practical knowledge of the different departmental workings of the line. After twelve years of that experience he was, in 1885, promoted to the General Manager's Office, where he faithfully discharged the duties of Chief Assistant to the late Mr. Wainwright. He also acted in the same capacity during Mr. Morton's management, and on Mr. Mathieson, Superintendent of the Line, being appointed Chief Commissioner to the Queensland Government Railway, Mr. Cooper took over in 1889 the responsible post of Superintendent of the Line. As everyone recognised at the time, he conducted that department with an ability that earned for him universal praise and which ultimately led to his selection as head of the Company. On the death of Mr. Brunton in 1894, Mr. Cooper was chosen to occupy the high and responsible position of General Manager of the railway.

The completion of a fifty years' active business career, even in ordinary circumstances, is an event that attracts attention. Whatever the career, it shows that the life has been rounded off in the way that Thomas Carlyle would have said should be the aim of every genuine man on this planet. It proves work, and useful work is always dignified and honourable. But when a life has been spent for half a century in the fierce competitive struggle of railway development, and in the management of a great railway, the event at once takes on a significance which raises it to the level of an historic incident in the history of Scottish railway enterprise. One will grasp more clearly Mr. Cooper's achievement when one remembers that prior to his assuming the management of the Glasgow and South Western he had served under three General Managers, Mr. Wainwright, Mr. Morton, and Mr. Brunton, whose combined services only reached nineteen years, compared with Mr. Cooper's twenty-three, and that since he joined the service he has seen no fewer than six changes—four from death—in the management of the Caledonian Railway, and four in the North British Railway. Likewise on his own railway the striking toll is none the less remarkable, that of the seven gentlemen who had occupied the high position of Chairman of the Company during his time, five have passed away.

The history of the Glasgow and South Western Railway is linked with the marvellous industrial progress of the West of Scotland during the last eighty years—a progress, by the way, which has not by a long way reached its developmental limits, and which in post-war times must of necessity make great forward strides before the mission of the Company is fulfilled. How the evolution of the railway has proceeded will be better understood by having recourse to some facts and figures. On July 15th, 1837, the Glasgow, Paisley, Kilmarnock and Ayr Railway Company was incorporated by Act of Parliament, the share capital being only £625,000, and the borrowing powers £208,300, while in 1914 the total share loan and capital amounted to £19,194,435 12s. 6d. In 1847 an Act was passed amalgamating the above companies into one company, which eventually assumed the name of the Glasgow and South Western, the first

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meeting under the new designation having been held in March, 1851. During Mr. Cooper's tenure of office great developments have marked the growth of the railway. In his early days he saw the opening of the Greenock line (1869); the extension of the Ayrshire line to Stranraer (1877); and the construction of the Glasgow, Barrhead, and Kilmarnock joint line opened in 1873. Within his recollection is the old Glasgow terminus at Bridge Street, now Eglinton Street, for it was only in 1876 that the St. Enoch station was brought into use, the well-known St. Enoch Hotel being added in 1879. It is, however, the period during which Mr. Cooper has occupied the position as chief officer that concerns us most at present. He has seen the enlargement of St. Enoch station to twelve from six platforms; four-tracking of the Ayrshire main line from Glasgow to Dalry—thence to Kilwinning, which included the construction of the North Johnstone and Dalry Railway; the extension from Newmilns to Darvel (1896); the extension from Paisley to Barrhead (1902); the Gatehead to Hurlford line (1902); the Catrine Branch (1903); the Renfrew and District Railway (1903); the Cairn Valley Light Railway (1905); and the Maidens and Dunure Railway (1906), as well as other important developments, amongst which were the acquisition by the Company of the Harbours of Troon and Largs. In this connection we cannot help alluding to the great success which attended the Company's efforts in linking up the coast traffic by means of a finely equipped and appointed fleet of steamers which in pre-war days numbered nine, and among which stood out conspicuous the popular *Glen Sannox*, built in 1892. It would be difficult to overestimate the boon that this fleet of steamers proved to West Coast traders and the public generally. Another notable incident in the progressive story of the railway was the building of the Turnberry Hotel (1906) and the laying-out of the celebrated golf course in connection with it and over which have been played many championship matches. This enterprise proved a wonderful success and added vastly to the revenue of the Company in the passenger traffic alone. St. Enoch Station Hotel, as already mentioned, was opened in 1879; Ayr Station Hotel in 1886, and Dumfries Station Hotel in 1897.

Then, as regards passenger train facilities, there is no line better equipped in the matter of permanent way and rolling stock. The carriages of the Company are modern in the best sense of the term, and the corridor trains between Glasgow and London will bear European comparison. For many years the Anglo-Scottish expresses in conjunction with the Midland Railway have been more or less standardised, and as loads have grown and traffic has increased the necessary provision has been made in the way of new and up-to-date rolling stock (with restaurant car accommodation on all principal services), while locomotives have been developed to meet increasing demands. On the busy Ayrshire lines, as well as to the Clyde Coast routes, steady progress and improvement has also been the rule, with the result that no line in Scotland can claim a greater volume of constant daily traffic all the year round from the suburban districts. The Ayr expresses, of which there are six each way daily in the season, do the journey in 50 to 60 min. between that important town and Glasgow, and other centres are likewise well catered for. The result has been a constant increase in travelling, and the recent pre-war statistics show that during the year 1913—including season ticket holders—no less than 25,157,294 passengers were carried by rail and steamers.

On the goods side of the railway immense improvements have also taken place, the "College" Goods Depôt, opened in 1874, has now an enormous volume of traffic concentrated there. Later developments embraced a great bonded warehouse: the first in Scotland, and still the only one in the kingdom belonging to a railway company where the blending and bottling of spirits is carried on at a railway station.

As giving some idea of the extensions of the system, it may be mentioned that in 1870–1—that is to say some three years after Mr. Cooper joined the service—the total mileage of the line in operation was only 253½, in 1894 it was 384½, and in 1913 492 miles, virtually double that when Mr. Cooper started as a lad in the service. During the same period coaching train miles increased from 1,038,932 in 1870 to 3,528,752 in 1894, and to 4,906,525 in 1913; while the goods and mineral mileage, which in 1870 was 1,761,126, increased in 1894 to 2,729,270 and to 3,249,071 in 1913. In 1870 the total receipts from traffic was £639,358, rising to £1,266,686 in 1894, and to £2,051,195 in 1913. To work the 253½ miles of line in 1870 the stock then comprised 185 locomotives, passenger train vehicles 494, and goods train vehicles 8,104. Now they

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number respectively 529, 1,639, and 19,001. Along with the rapid growth in receipts there has, of course, been a corresponding development in the revenue expenditure, which in 1870 was £282,334, in 1894 £729,878, and in 1913 £1,294,301.

The Company was the pioneer in Scotland, and probably in the United Kingdom, of the cheap Saturday to Monday fares—an innovation the popularity of which was proved by its being successfully adopted by other railway companies. The Glasgow and South Western also inaugurated with much success the Friday to Monday bookings, half-day excursion trips, and extensive coaching tours.

At the present juncture in the history of the country it is interesting to note that some years ago a Railway Army Corps was formed, called the "Engineer and Railway Staff Corps," its mission being to arrange the rapid mobilisation of troops in the event of the country's invasion. At the present time Mr. Cooper is a Lieutenant-Colonel in the corps, and has occupied that position since he was appointed in 1904. This corps had to do with the organisation of the machinery connected with the transport of troops and the handling of war material. In connection with this corps he was invited by the King to attend the last Levee held prior to the war, at St. James's Palace, where he had the honour of being presented to His Majesty.

Mr. Cooper has two fundamental characteristics, which must have largely influenced his life and destiny—silent determination of character and honesty of purpose. The former is always found in a strong man. His other characteristic—honesty of purpose—embraces the square deal to everyone, rich and poor. His word has always been as good as his bond, his promise a fulfilment. He was General Manager in his thirty-ninth year, and at that time, we believe, he was the youngest General Manager in the United Kingdom. He is, as already stated, pre-eminently a modern man who has in thought and action kept pace with the times, and therefore the railway which he practically controls has never suffered from the inroads of conventionality—in progressiveness it is to-day in the vanguard of the railways of Great Britain. Mr. Cooper would be the first to acknowledge his indebtedness to the various officers of the Company, on whose loyalty and co-operation he could always rely.

The social side of Mr. Cooper's life has not in the least suffered by fifty years' immersion in railway business. He has lived a full life and has extracted as much pleasure from the world as most men. He is a Justice of the Peace for the County of the City of Glasgow and for the County of Renfrew, and his membership of educational, artistic, and social societies may be reckoned by the score. During the period which he acted as Superintendent of the Line, Mr. Cooper had the honour of being elected Chairman of the Superintendents' Conference of the Associated Railway Companies of Great Britain, and in his present position he had a similar honour conferred upon him by the General Managers' Conference. He has from the outset of the ambulance movement taken a keen and active interest in the work, and, prior to the war, his eldest son, Mr. John M. Cooper, who occupied an important position in the Manager's Department, has also very closely identified himself with the movement. Mr. Cooper has for many years been a member of the Council of the St. Andrew's Ambulance Association.

In connection with the employees, a Railway Temperance Union was established some years ago, with branches in the leading centres throughout the system, and as showing the practical interest taken in its success by Mr. Cooper, he has invariably presided at their annual meetings and given the Union his heartiest support. It has proved a great success, the membership rising from 290 members enrolled the first year, to now over 5,000, which is nearly two-thirds of the total employees. Mr. Cooper has also frequently figured as chairman at the employees' annual social meetings, and at one held recently he was proud to be able to say that for intelligence, courtesy, sobriety, and general standard of excellence, the Glasgow and South Western men had few equals, and certainly no superiors.

In the Railway Benevolent Institution, Mr. Cooper has all along taken a deep and abiding interest, which has done so much good on behalf of disabled railway servants, their widows and orphans. He has been Chairman of the Scottish Branch of the Institution for the last seven years. His Royal Highness The Prince of Wales has recently intimated his acceptance of the Presidency of the Institution for 1918.

Mr. Cooper has three sons, who when war broke out gallantly responded to their country's call. All three are officers—two being Captains in the Royal Engineers, who have seen much active service, and the third is a Second-Lieutenant in the H.L.I.

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The celebrating of fifty years of golden service under the fierce strain of railway life —more especially when almost half of the period has been spent in the controlling as General Manager of a great railway—is indeed a record which few, if any, of our great railway veterans of the past have ever achieved. We are confident that we express the wish of many thousands of Mr. Cooper's friends in extending hearty congratulations to him on this unique occasion, and the wish that he may be still associated for many years with an undertaking with which his life has been so signally and wholly identified.

An American View of British Train Speeds.

IN *The New York Metropolitan* Mr. William Hard has been writing on "How the English Take the War," and his articles have been reprinted as a pamphlet and published by Messrs. Hodder and Stoughton in London, New York and Toronto.

Under the caption "The English Hate to Talk about their Efficiencies," the writer cites the case of the railways. The English, he says, will commit efficiencies but they hate to divulge them.

In support of his theory he continues :—

"I happen to be a collector of train speeds. English trains, on certain types of runs, are extraordinarily fast. You can go from Bristol to London in exactly two hours. The distance is 117 miles. The rate of speed is, therefore, 58½ miles an hour. The most comparable run in America is from Philadelphia to New York on the Pennsylvania Railroad. The length of that run is 92 miles. The fastest train on it does it in two hours. Its rate of speed is, therefore, 46 miles an hour. It is a high rate. It is not so high as the rate from Bristol to London, but it is high ; and the Pennsylvania's fast trains are fast trains ; and you know that they are fast trains ; because the Pennsylvania Railroad provides you with a thrilling little folder which tells you that they are fast trains. Would the Great Western Railway Company, on the run from Bristol to London, provide you with any similar information and elation ? Certainly not. If you happen to be a bit soft in your wits on the subject of train speeds, you dig the running time out of one big, fat, uncomfortable book, which you buy with your own money at a news-stand, and you dig the mileage out of another big, fat, uncomfortable book, which you likewise buy for yourself with your own money, and you put these two figures together, and you discover by your own exertions that you are riding on one of the fastest trains in the world. Otherwise, if you are a normal sane person and no collector of train speeds, you simply ride on one of the fastest trains in the world and never know it."

Further Mr. William Hard tells the story of how he called on the President of the Board of Trade—then Mr. Walter Runciman—and confessed to him his infirmity in the matter of train speeds, and from the Board of Trade records he was shown that during the first seven months of the war—that is, during the time of the greatest congestion and confusion—not one train carrying troops or supplies officially on official schedules was as much as ten minutes late in arriving at its destination !

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British Railway Service and the War. [XVII.]

THERE is nothing like a war to make or break the reputations of a nation's leaders, and so far as the British Empire is concerned there is no subject of His Majesty the King who has made more remarkable progress in national service and public recognition than Sir Eric Geddes, who at the outbreak of war was Deputy-General Manager of the North Eastern Railway.

Politicians like the present PrimeMinister, Mr. Lloyd George, and soldiers like Sir Douglas Haig, were known to fame before hostilities commenced, but in England, save in the north-eastern counties, and then only as a leading railway officer, Sir Eric Geddes was quite unknown to the general newspaper reader. True, he is but one of the many railway officers who have rendered to the State yeoman service in a multitude of ways since that fateful August day in 1914, but Sir Eric's progress is generally admitted to be at present unsurpassed in the annals of the prevailing terrible and tremendous conflict.

It speaks well for the railway industry, and not alone for the energy and capacity of Sir Eric Geddes and other leading railway officers, that each successive war Government has to call on the railway service for help when men of real executive ability and organising power are in demand. This fact should effectually silence those ill-informed, but carping critics, who in pre-war days were in the habit of foolishly affirming that British railway officers did not comprehend their business. Such critics have been completely confounded. The war has proved not only are British railways officered and staffed by men who understand the industry, but that in the day of doubt and difficulty these are the men to whom the nation can turn with confidence for help.

Photo [*Elliott and Fry.*

SIR ERIC GEDDES, K.C.B.,
First Lord of the Admiralty.
(Deputy-General Manager of the North Eastern Railway.)

Sir Eric Geddes, K.C.B., who was in May last made the head of a new department of the Admiralty with the title of Controller, and with the honorary and temporary rank of Vice-Admiral, is now First Lord of the Admiralty in succession to Sir Edward Carson. Before going to the Admiralty, Sir Eric was largely responsible for the magnificent achievement in railway construction in France, which was a feature of last autumn's work behind the British front. A man of strong character and great administrative ability, he is only 42 years of age. He was

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originally intended for the army, but after passing the preliminary examination went to the United States, where he took up railway work on the Baltimore and Ohio. In 1895 he left America for India, where he became Traffic Manager of the Rohilkund and Kumaon Railway. That position he relinquished in 1904 on returning to England to become Claims Agent of the North Eastern Railway. In 1911 he was appointed Deputy-General Manager. During the war he was first attached to the Ministry of Munitions, and in 1916 was appointed Director-General of Military Railways and received a knighthood. In his recent capacity as Controller at the Admiralty, he was responsible for meeting the combined requirements of the Admiralty, the War Office, the Ministry of Shipping and other Government Departments in respect of the design, construction, alterations and repairs of warships and other vessels of all classes, and the requirements of the Admiralty in respect of armaments and munitions. He was made a K.C.B. on the occasion of the King's Birthday. Sir Eric Geddes had the honour of being received by the King at Buckingham Palace when His Majesty invested him with the insignia of a Knight Commander of the Most Honourable Order of the Bath (Military Division).

A seat in the House of Commons has been found for this notable railway man; he has been elected to Parliament as the unopposed member for the Borough of Cambridge. In its time the grand old borough has been represented in the House of Commons by many remarkable and distinguished men, but it is doubtful whether it has ever had a member with a career at all parallel with that of its present one.

In his maiden speech to his constituents at Cambridge—made a few days after his election—Sir Eric said :—

"I had not the slightest idea, 14 days ago, either that I was to be First Lord of the Admiralty or that I should have the honour of being the Member of Parliament for the ancient and historic Borough of Cambridge. However, the unexpected happens, and I am here this evening, though it will mean an extra half-day's work to-morrow, I fear. (Laughter.) The railwaymen of England I hold in the highest regard, and that regard has been intensified by what I have seen of their work in France. The railwaymen out there have given movement to the Army. Railways are now ahead of the guns everywhere—(cheers)—and the work of the railwaymen has saved thousands and thousands of lives at the sacrifice of many of their own. I have been asked to tell you about myself. I have read in a local paper that I am a young man about whom you know very little. I never, I hope, was unduly proud, but if I was that took it all out of me. (Laughter.) There is not much to tell. I have worked since I was 17. I have never played much or long, and none at all in the last three years, during which I have worked harder than ever before.

"What little politics I had I have forgotten in the munition factories, in France, in the dockyards, and with the Fleets. Before the war I had done soldiering in India. At the beginning of the war, at Lord Kitchener's request, I raised and commanded one of the finest pioneer battalions that ever went to France. I went to the War Office and had a hand at most things there, except shell production. Then I went to France, first to report, and later to join Sir Douglas Haig's staff. It was what I saw in France that gave me my determination that nothing mattered but to go on with the war to the end. To one who has spent months in France, who has witnessed the wreckage of the most malicious retreat in the history of the world, with its wanton ravishing of the country and villages, one feels that the sole thing that matters is to go on with the war. I don't know that I have any hate in my composition, but I am convinced that we have got to destroy the German military power—(cheers)—and I am convinced that we and our Allies are doing more now to destroy that power by advancing as fast as we can lay railways and roads to carry the traffic."

Sir Eric Geddes receives no remuneration from public funds as First Lord of the Admiralty; he has in fact throughout the war continued his contractual relationship with the North Eastern Railway.

In the face of his record, RAILWAY MAGAZINE readers will doubtless be unanimous in regarding Sir Eric Geddes not only as the most outstanding figure in this series of articles, but something more than that—nothing more nor less, than one of the wonders of the war!

Lieut. J. W. Charlton, Royal Inniskilling Fusiliers, formerly in the Enniskillen District Office of the Chief Engineer of the Great Northern Railway (Ireland), has

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recently been awarded the Military Cross for gallantry in the action at Messines on June 7th, where he was wounded.

This is the second case of a member of the Great Northern Railway (I.) staff having joined His Majesty's Forces, to receive the Military Cross, the previous recipient being Capt. C. H. Slater, Royal Irish Rifles, who was also in the Chief Engineer's Department.

Circumstances prevented the staff of the London, Brighton and South Coast Railway meeting on the anniversary of the declaration of war, so at the invitation of the Earl of Bessborough, K.P., the Chairman of the Company, a large number of the head office and uniformed staff assembled at 12.30 p.m., on August 7th, to remember their colleagues at the front and to sing the National Anthem. Briefly addressing those present, Lord Bessborough said :—

"We meet to-day, as in the last two previous years to hear just a few words and to sing 'God Save the King.' I can only hope it may be for the last time. I have just got the figures of the men in our service who are away. The total number of men who have left for active service is 4,529. Roughly speaking the percentage of the whole staff is about 28 per cent. Of these 277 have fallen in action, 330 have been wounded, 28 are prisoners and 23 are missing, and we are glad to think that up to to-day 30 of our men have received decorations.

"Now may I ask you, with bowed heads, solemnly to salute those who are gone and have given their lives in the sacred cause, a cause which as you are well aware is for the liberty of Europe, if not for the whole world. Also at the same time, may I ask you individually and collectively as those associated, as we all are with our Railway, solemnly to resolve that you will do everything in your power to bring this war to a successful conclusion? We must ensure that all who have gone shall not be hindered and that their great sacrifice shall not be made in vain.

"May I ask you now to keep silent for one minute and hold in remembrance those of our fellow workers who are in danger on the land, on the sea and in the air and then after that sing together, standing to attention, 'God Save the King.'"

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are :—

L. & N.W. : Jan., Feb., March, May, 1915.
Great Northern : June, July, 1915.
M.S. & L. : Aug., Sept., Oct., 1915.
Great Western : Nov., Dec., 1915 ; Jan., Feb., March, April, May, June, July, Aug., 1916.
Glasgow & S.W. : Sept., Oct., 1916.
North Eastern : Nov., Dec., 1916 ; Jan., Feb., March, April, May, 1917.
South Eastern : June, July, August, 1917.

In October, 1917, Mr. Ahrons will continue to deal with The Lancashire and Yorkshire Railway.

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New Wide Main Line Corridor Carriage Stock for the Midland Railway.

JUST before the outbreak of war the Midland Railway Directors decided to build a number of main line carriages in which the familiar Midland clerestory roof gave place to the newer semi-elliptical style. A few of the new cars are now working on the 9.10 a.m. train, Manchester to St. Pancras returning to Manchester at 4.15 p.m. same day. The stock is composed of three types, *i.e.*, a composite brake, a third-class and a third-class brake, each having lavatory accommodation.

Special features of the design are the square side construction of the guards and luggage compartment, this latter is in order to obtain "look-outs" for the guard along the side of his train, the width over which does not exceed the Company's standard loading gauge. The body sides of the passenger compartment sections follow the now well known contour of 9 ft. wide main line carriages—this will clearly be seen on close examination of the end view. The section width allows of three comfortable seats a side with arm rests in the first-class compartments and four seats in the third.

The body is framed in oak with mahogany outside panels and mouldings, and first-class compartments are finished in walnut and upholstered in blue cloth, whilst the third-class compartments are finished in mahogany with terra-cotta plush upholstery.

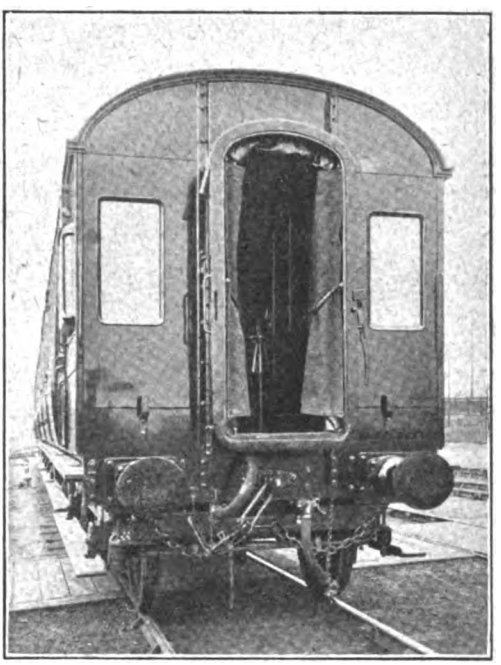
All ceilings and partitions, above the net racks, are lined with "Salamander" hard compressed asbestos millboard and painted dead white and the passenger compartments have frames showing places of interest served by the Midland Railway.

Each first-class compartment is provided with two hassocks which add to the comfort of passengers, especially ladies. The first-class corridors are moulded and panelled in walnut, and the third-class with mahogany, whilst all interior wood-work fittings are polished.

The first and third-class lavatories are lined with white tile pattern "Endeca" with mouldings of walnut and mahogany respectively, whilst the water-closet is provided with an automatic flush, a predetermined quantity of water being retained in the hopper when in use and ejected by closing the lid—this arrangement keeps the hopper clean and sanitary.

Floors, throughout, are covered with linoleum except the lavatories, these being laid with "Decolite" cement; whilst the first-class compartments have rugs, and the corridors leading to them are carpeted.

The carriages are heated by a direct steam system, under the control of passengers, a heater being placed under one seat in each compartment and also in the lavatories to prevent the water being frozen in severe weather; the usual valves are fitted with the object of effecting the liberation of water from condensation with the minimum waste of steam.



MIDLAND RAILWAY NEW ROLLING STOCK.
View of Steel End.

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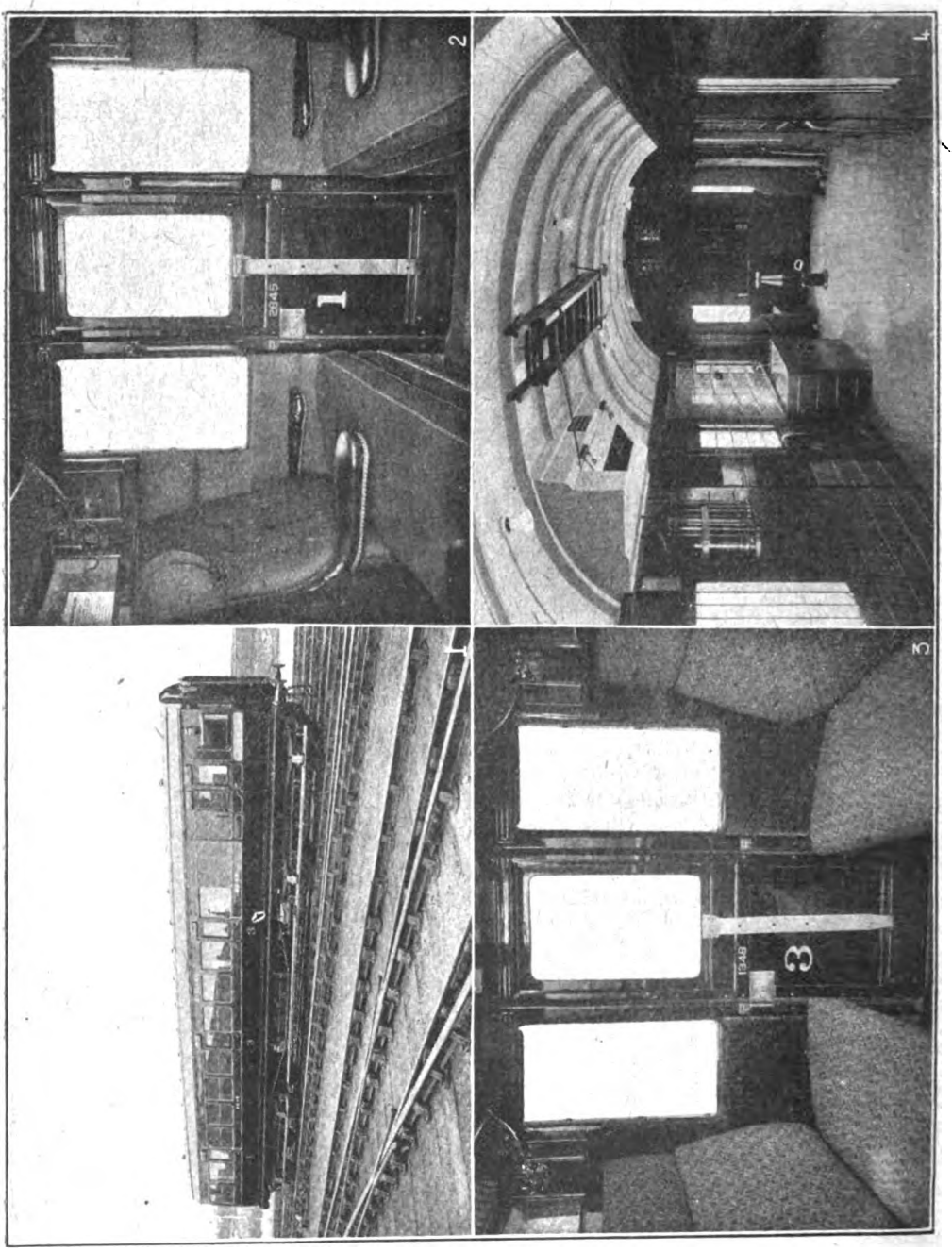
MIDLAND RAILWAY NEW WIDE MAIN LINE CARRIAGE STOCK.



1. Corridor Composite Brake. 2. First Class interior. 3. Third Class interior.
4. Brake Compartment interior.

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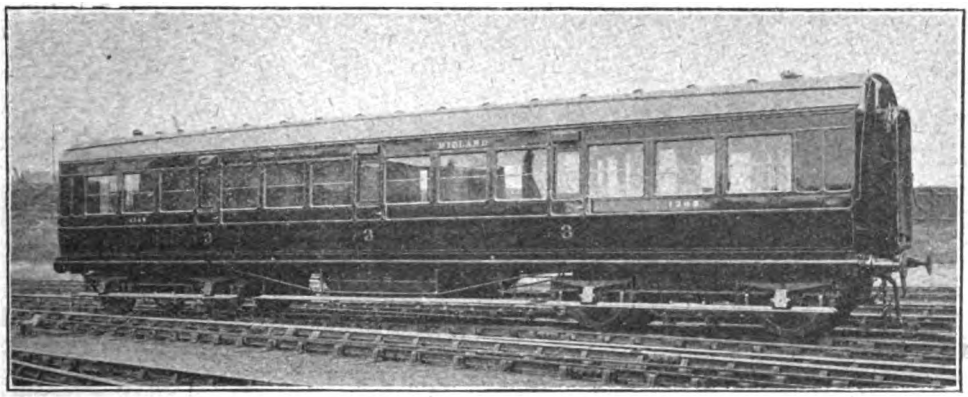

MIDLAND RAILWAY NEW ROLLING STOCK.
Third Class Corridor Coach.

Stone's "Liliput" System of electric lighting with individual control of the lights is installed throughout.

In order to minimise the danger of telescoping in the event of collision, the ends and gangways are constructed of steel, and Spencer's Patent Buffers of a specially strong design are fitted, the latter having oval faces, the vertical face being quite straight, thus obviating the tendency of buffers to mount each other, as in the case of curved faces. The buffer guides are fitted with inner plungers at the back of which are auxiliary rubber springs for the purpose of absorbing severe shock.

All floor, roof and partition boards and the interior panelling are fireproofed.

In each brake compartment an emergency outfit, consisting of tools, fire buckets and extinguishers, ladders, etc., is provided.

All the interior metal fittings, in both first and third-class compartments, are oxidised bronze.

The chief dimensions, etc., are as follows :

	ft.	in.
Length of body	54	0
,, first class compartment	7	3
,, third class ,,	6	3
,, bogie centres	37	0
,, ,, wheelbase	10	0
Width of body inside	8	4⅞
,, ,, outside (Passenger Compartments)	9	0
,, ,, ,, (Guards and Luggage)	8	6
,, of corridor	2	0 11/16
,, over foot-boards	9	0
Height above rails	12	5½
,, to top of cornice	10	8
,, centre of buffers	3	5¼
Weight in running order	29 tons	

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper right-hand corner, and address them to the Editor. Questions relating to the names, numbers, dates, dimensions, etc., of locomotives should not be forwarded, and queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o of the Editor of the RAILWAY MAGAZINE. *Queries should not be of purely local interest. Correspondents are requested to write on one side of the paper only. Before asking for information concerning railway history, leased and worked railways, electrically operated railways, rolling stock statistics, notable railway accidents, tunnels, speed table for timing trains, and the like,* RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book" (2s. 6d. net), the twentieth annual Edition of which is on sale at the* RAILWAY MAGAZINE *Offices, 30, Fetter Lane, Fleet Street, London, E.C.4. By post in British Isles 2s. 11d., Abroad 3s.*

Midland Railway London Traffic.

Questioner could obtain the information he requires by referring to Mr. Timins' article on "St. Pancras" in the RAILWAY MAGAZINE, June, 1902, but as this part has been out of print for several years the following paragraph is quoted:

"In the early days of the line, traffic for London was handed over to the London and North Western Railway at Rugby, as the Midland Railway was principally concerned with the goods and passenger services which it had organised in the counties from which it took its name, and apparently were content to hand over to the other companies running North and South, with whom it worked in connection, traffic for London and the North arising on the Midland system. The construction of the Wigston to Hitchin Junction line, which was opened for passenger traffic on April 29th, 1857, brought the Midland into closer touch with the Great Northern, and resulted in the handing over to that company, at Hitchin Junction, of the through traffic to London. At first the Midland did not run any through trains to King's Cross, but obtained running powers to do so in 1858, with the usual result in such cases, *i.e.*, that the Midland expresses were constantly blocked by Great Northern slow trains, until matters came to a climax in 1862, the year of the Great Exhibition, when no fewer than 3,400 Midland trains—1,000 passenger and 2,400 goods—were delayed on the Great Northern system. This, coupled with the summary 'eviction' of Midland rolling stock from the Great Northern sidings on June 30th, 1862, brought matters to a head, and an independent route to London, through Luton, St. Albans, and Hendon, was surveyed, constructed, and finally opened for passenger traffic on October 1st, 1868."

[Reply to A. F. JOHNS.]

Electrical Power on Railways.

On the application of a railway company, the Board of Trade has power to make orders for facilitating the use of electrical power on the railway, authorising its use, the construction of generating stations, etc., and agreements for the supply of power and plant, sanctioning the modification of working agreements, securing the public safety, etc., and these orders have the effect of an Act of Parliament.

If the order contains power for the compulsory acquisition of land, and it cannot come into operation, so far as concerns that power, until confirmed by Parliament, the Board of Trade may bring in a Bill for confirming the order, and the Bill, if opposed, may be referred to a Select Committee in the ordinary way.

Before making an order the Board of Trade must see that public notice of the application has been given, must hear objectors, and may hold an enquiry. The Board has made rules for carrying out these powers.

See Williams' "Epitome of Railway Law" [6s.], published by Stevens & Haynes, Bell Yard, London.

[Reply to P. G.]

Grimsby Docks and Grimsby Fish Trains.

Grimsby, the premier fishing port in the world, owes its prosperity to the enterprise

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of the Great Central Railway. Soon as the fish trains, you refer to, are loaded up they proceed through the dock yards to Grimsby Dock station, whence they travel to Sheffield, the central point, from which diverging routes carry fish to the principal markets of Manchester, Liverpool, Leeds, Nottingham, Birmingham and London. If you will peruse the two or three pages in the Railway Year Book giving details of the accommodation and arrangements for fish traffic at Great Grimsby Docks, which belong to the Great Central Railway, you will readily understand why the latter company conveys so much fish from the port.

It does not invariably follow that the shortest route is the most expeditious. There are other considerations besides train mileage, and there is such a thing as congestion where a line is crowded with traffic.

[Reply to G. CULLIS.]

Brakes on Electric Trains.

It is generally considered the Westinghouse, or compressed air, system of braking gives better deceleration of trains than that known as the "vacuum" brake. The latter is, however, cheaper in the first cost, and has been adopted more largely in Great Britain than the Westinghouse system. On lines where trains follow one another at very short intervals, such as electrically operated railways, it is essential that not only the acceleration from rest, but also the deceleration prior to stopping, shall be as rapid as possible, in order that the maximum advantages of electric over steam traction, in the matter of curtailment of time, may be realised. On this account, therefore, the Westinghouse brake has been adopted almost exclusively on the electric train services of this country. The quick-acting Westinghouse brake is probably the most powerful type of brake in existence.

[Reply to REV. J. A. L. ATTHILL.]

Furthest from a Railway Station.

To find out what town or village in Great Britain is furthest from a railway station you should consult the Railway and Commercial Gazetteer of England, Scotland and Wales. This work contains a complete list, arranged in alphabetical order, of every town, village, parish and place in Great Britain—over 45,000, including the most obscure hamlet, indicating opposite each the distance from London, nearest railway station, distance from station, with through rate routes, also information concerning postal and telegraph arrangements. The book is published at 10s. 6d., and can be forwarded by post from the offices of the RAILWAY MAGAZINE on receipt of 11s.

[Reply to W. PRATT.]

2-6-2 Locomotive, Midland Railway.

The one 2–6–2 engine shown in the Midland Railway locomotive lists is an experimental 8-cylinder tender goods engine, numbered 2299. It has never been engaged on any regular working.

[Reply to RALPH B. WALLIS.]

London and North Western Railway Engines.

"Precursor" class locomotive, No. 1363, *Cornwall*, now bears the name of *Brindley*. The name *Cornwall* was removed when the old 8 ft. 6 in. passenger engine re-appeared in May, 1911.

[Reply to JAS. R. WHITAKER.]

Cylinders and Wheel Arrangements.

Questions are not quite clear. Do you refer to the new Maunsell 2–6–4 tanks of the South Eastern and Chatham Railway? These have outside cylinders. What do you mean by a "crossed piston rod"? Latest Great Northern Railway express locomotives are of the Atlantic type, *i.e.*, 4–4–2. All the Great Eastern Railway 4–6–0 locomotives have inside cylinders and the wheel arrangement is as correctly stated by you. See diagram of Locomotive Wheel Arrangements, page 51, *Railway Year Book*, 1917. Thanks for good wishes.

[Reply to DOLLAND J. R. WARD.]

4-6-0 "Glenalmond" Class, Great Central Railway.

Built in 1913, the pioneer 4–6–0 express goods engine of Class 1A—No. 4, *Glenalmond*—was followed in 1914 by Nos. 279, 280, and 439–446 inclusive, of the same type. No. 279 has since received the name *Lord Kitchener of Khartoum*, and No. 446 that of *Earl Roberts of Kandahar*. These engines are practically identical with the express passenger and mixed traffic engines of the "Sir Sam Fay" type, save for having 5 ft. 7 in. in place of 6 ft. 9 in. driving wheels. No. 279 was illustrated in the RAILWAY MAGAZINE, page 97, August, 1916.

[Reply to T. G. FENDICK.]

Speed Records.

There is no trustworthy evidence to substantiate the statement that the distance between Bristol and London was covered in

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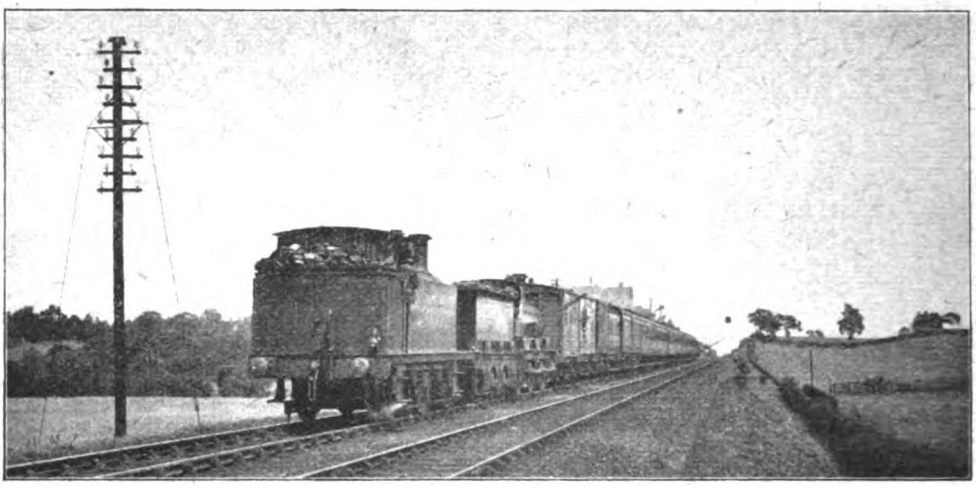

MIDLAND RAILWAY.
Lickey Incline.

1½ hours in the year 1845. It is in the highest degree improbable that the engines of that period obtained any speed approaching 79 m.p.h. even on favourable gradients, let alone maintaining such a speed for nearly 120 miles. We fancy that this story is one of those speed "myths," which have occupied attention in the RAILWAY MAGAZINE on more than one occasion.

[Reply to T. G. FENDICK.]

French Gradient Boards.

The figure or figures above the line give the gradient in millimetres per metre. The figures below the line show the distance in metres over which the gradient extends. In the case of the gradient board your son sketched, the line falls at the rate of 11 millimetres per metre (about 1 in 91) for a distance of 1,100 metres to the right of the post, and is level for 1,090 metres to the left of the post.

[Reply to J. R. BLABY.]

Servé Boiler Tubes.

Tube heating surface is the surface area of heated metal in actual contact with the water in the boiler, and is therefore based on the external diameter of the tube. In the Servé pattern tube, which is designed with longitudinal external "fins" or ribs, in order to increase the radiation, the surface of these fins is taken into account in calculating the heating surface of the tube.

[Reply to W. S. UPTON.]

Lights on Lickey Incline, Midland Railway.

At the top of the Incline (at Blackwell) there are two gas lamps with large reflectors, one on the up and one on the down side of the line. They are solely for the purpose of enabling brakesmen to effectually carry out the duty of pinning down wagon brakes before the trains descend the Incline. There are no exceptional lights at the bottom of the Incline.

[Reply to B. S. BROWN.]

The Scottish Border.

Royal Border Bridge, Berwick-on-Tweed, North Eastern Railway, was opened August 1st, 1850. See Railway Year Book, 1917, page 229. Berwick-on-Tweed railway station, North British Railway, was fully illustrated and described in RAILWAY MAGAZINE, June, 1909. From this article all points you raise can be answered. A few parts are still in print: 6d. each. By post 8½d.

[Reply to W. PRATT.]

Numbers on Cab Sides, Midland Railway.

The small numbers on the upper part of the cab side-sheets on Midland Railway locomotives indicate the power classification of the engines concerned, *i.e.*, the loads that they may convey on the different time-schedules without piloting assistance. For the actual classification assigned to the different Midland types, see reply to Ralph B. Wallis in the June, 1917, issue, page 420.

[Reply to JOHN DUNCAN.]

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London and South Western Railway Gradients and Summits.

On the London and South Western Railway the steepest gradient is on the Ilfracombe branch, and falls 1 in 36 for about 2¼ miles between Morthoe and Ilfracombe stations. On the main line, London to Exeter, there is a rising gradient of 1 in 80 for 2⅛ miles, 1 in 70 for ½ mile, 1 in 250 for ⅛th mile, 1 in 80 for 1 mile and 1 in 132 for ¾ mile from Seaton Junction station to Honiton Tunnel; and on the main line, London to Southampton, there is a falling gradient of an average of 1 in 250 for 16½ miles from Litchfield Tunnel to Eastleigh station.

The summits of the railway are :—London to Portsmouth—30 chains north of Haslemere, about 475 ft. above sea level.

London to Southampton — Litchfield Tunnel, between Basingstoke and Micheldever station, 400 ft. above sea level.

London to Exeter—Honiton Tunnel, between Seaton Junction and Honiton, 500 ft. above sea level.

Exeter to Plymouth—at a point about one mile west of Meldon Junction, between Okehampton and Bridestowe, 950 ft. above sea level.

Ilfracombe branch—at Morthoe station, 600 ft. above sea level.

[Reply to " Q."]

London and South Western Railway Locomotives.

All locomotives built by Mr. Adams had rimless funnels. Locomotives built by him but not now having rimless funnels are not as originally constructed. No London and South Western Railway engines are officially known as " Bulldogs," or by the other titles you mention, although such nicknames may be given certain engines by some members of the railway staff.

[Reply to H. W. R. SOUTHALL.]

Lancashire and Yorkshire Railway Engines.

The 4-cylinder 4–6–0 locomotives of the Lancashire and Yorkshire Railway have two of the cylinders outside. There are also some outside cylinder 0–6–0 shunting tanks, and certain of the 0–8–0 type were built as compounds with the L.P. cylinders outside, but these, we believe, have been converted to large-boilered inside cylinder engines.

[Reply to DOLLAND J. R. WARD.

Fast Running on the London and North Western Railway.

Fastest passenger booking prior to the war between Euston and Carlisle was 5 hrs. 48 min. by the first portion of the 10 a.m. " Scotsman " from Euston, due Carlisle 3.48 p.m. There has never been any schedule such as that mentioned in your letter, since the " Race " of 1895.

[Reply to RIFLEMAN P. PAVEY.]

Gradients.

Great Central Railway gradients were illustrated and described in the RAILWAY MAGAZINE, August and September, 1903. Midland Railway gradients were similarly dealt with April, May and June, 1906. All these parts are out of print, but might be secured at a second-hand bookshop.

[RALPH B. WALLIS.]

Somerset and Dorset Railway Head Code.

Engines of Somerset and Dorset passenger trains carry a white light at the foot of the chimney and a green light over the left buffer. Goods trains on same railway carry a white light at the foot of the chimney and a green light over the right buffer.

[Reply to KENNETH M. BRYDONE.]

Distant Signals.

Provision is made in every locking frame to prevent a signalman from pulling off his distant signal until both the home and starting signals (and advanced starting signal, where used) have been lowered.

[Reply to W. S. UPTON.]

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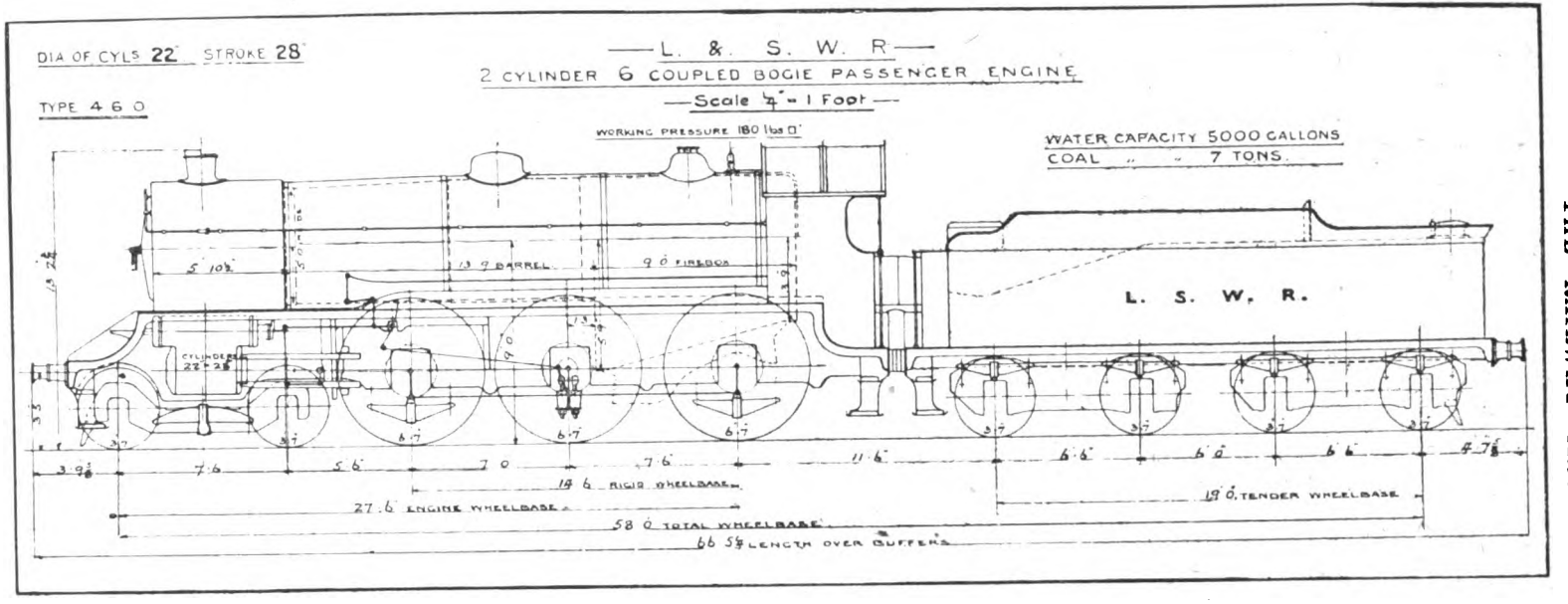
LONDON AND SOUTH WESTERN RAILWAY LOCOMOTIVES.



We are indebted to the London and South Western Railway for the above diagram of the latest type of passenger engine, ten of which are at present undergoing construction at the Locomotive Works, Eastleigh.

It will be noted that they have six-coupled wheels, giving them the maximum weight for tractive purposes, and their diameter is of a size to suit the high average speeds which they will have to maintain on the heavy and fast express trains of the London and South Western Railway.

These engines will be equipped with the "Eastleigh" superheater, hot water injectors, feed-water heater, sight-feed lubricators, and the usual power brakes. The general details duplicate with those of the 486 class, and the locomotives, when completed, will present a very similar appearance, as may be seen from the diagram.

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Traffic Control on the Great Northern Railway.*

GREAT SAVING IN LONG HOURS AND ENGINE MILEAGE.

CONTROLLING train movements from a central office is now a recognised method of operation in this country. Based on the American train dispatching system, but modified therefrom in that the controller has no responsibility for the actual signalling of the trains—which still remains in the hands of the signalman—the substance achieved by the traffic control system is that a railway or division of a railway is in telephonic communication with every station, junction and siding on the system or the division. At a central point is provided a traffic controller's office, and the system or division is divided into areas or sections. In the traffic controller's office, working under a chief controller, are sectional controllers, each of whom has charge of an area; all the signal-boxes, stations, yards, engine sheds, etc., in the area being in telephonic communication with him.

Broadly speaking, the movements of passenger trains are not interfered with unless they be running so late that other passenger trains are likely to be affected. Also that all regular goods and mineral trains adhere, as near as possible, to their booked timings, loadings, calls, etc. The purpose of the traffic control is more in the direction of ensuring the prompt handling of traffic, to modify train movements as may be required to meet traffic contingencies, to avoid long hours by enginemen and guards, and to use engine power to the best advantage. The traffic controller requires, therefore, to know what traffic is to be expected; what wagons loaded, partly loaded, unloaded and partly unloaded are on hand; the destination of what loaded wagons are ready for transit; what engine, enginemen and guard are working each train; information as to the load, for what stations and how much for each station on every train leaving the initial station in his district; the time of arrival and of departure of each train from every stop made and its load, together, in some cases, with an intimation as to the next stop to be made. This information he keeps before him in various forms, and it enables him to act as the "nerve centre" for the area and to control all the movements to be made.

Traffic control is therefore not only of benefit to the railway company, but also to the trader. The benefits to the trader would appear to be: An efficient supply of wagons; the prompt dispatch of wagons when they are ready for transit; the provision of suitable trains for through loads; the provision of special trains when necessary; direct communication with a responsible party for inquiries or to make special arrangements for traffic. The benefits to the railway are, of course, more numerous. They include: The supply of wagons to a trader to be exactly in accordance with his needs; no train need make a call if there be no traffic for it, or if the traffic is not ready; suitable trains can be selected to call for through loads; special trains can be arranged for additional traffic; trains may be modified to suit the exigencies of traffic; calls at stations may be inserted or dropped to suit traffic. As regards the workings of trains, the loadings may be modified to suit the class of engine and, possibly, to meet the temperament of the driver, also in accordance with the weather. If on arrival at the end of a trip there is no immediate work for the trainmen, the controller may be able to find some. When overtime for enginemen or guards may be likely, the workings of their trains may be modified, *e.g.*, by further calls being dropped or the train shunted and the engine, with or without the goods brake, running forward light; if relief will be necessary, the controller will arrange it, and the relief men will know where to find the train and the trainmen will know where and when they will be relieved; men relieved can be told how they are to come home. By

* Published by arrangement with *The Railway Gazette.*

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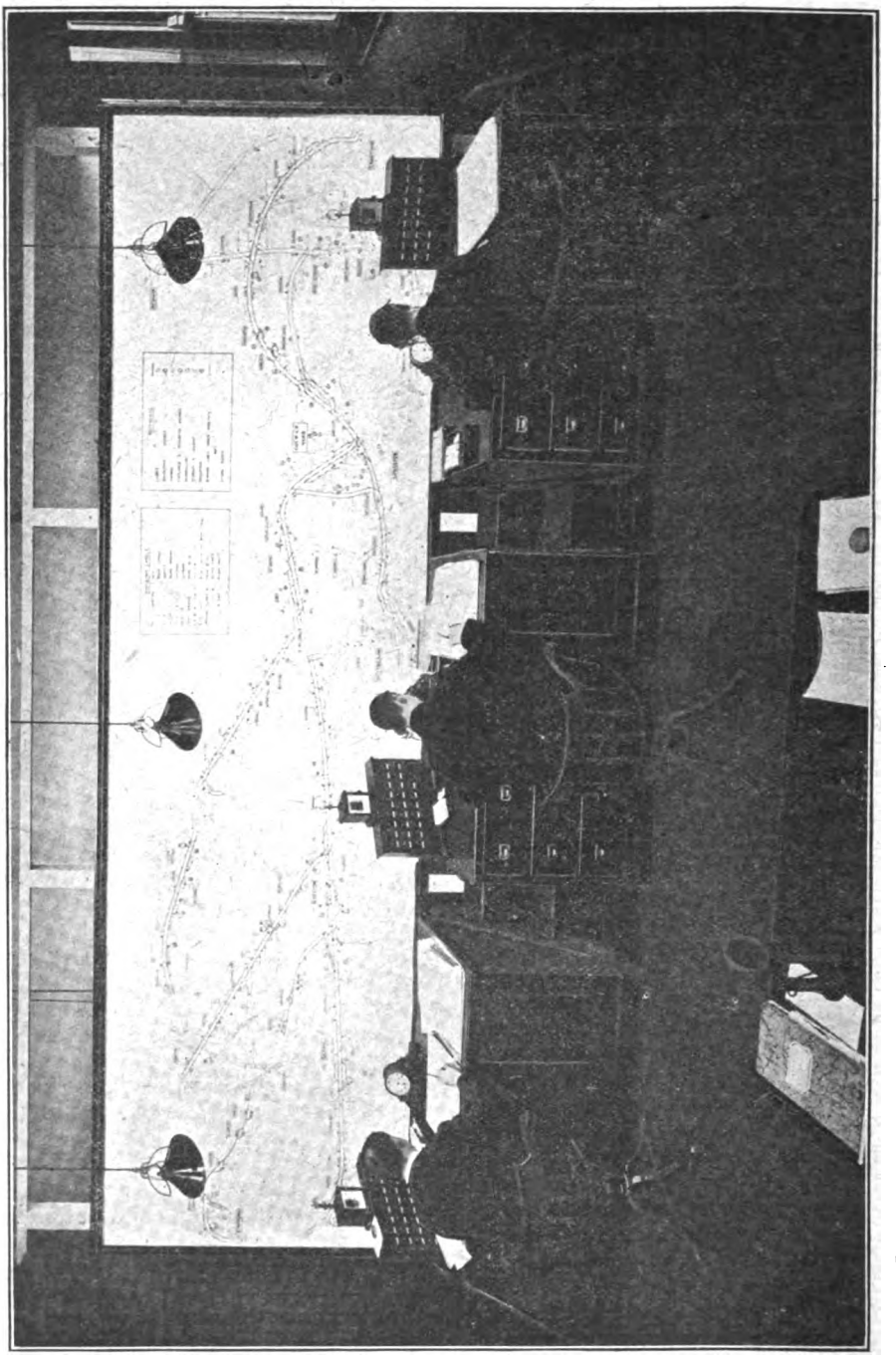

NOTTINGHAM CONTROL ROOM, GREAT NORTHERN RAILWAY.
(Western Electric Company's System of Traffic Control.)

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knowing what work has to be done the controller can see that no time is wasted at stations. If the stoppage seems a long one he can ring up and inquire why. Through the traffic controller, goods stations can be quickly supplied with such special equipment as boiler wagons, tank wagons, etc., and passenger stations with horse boxes, carriage trucks, motor car vans, etc.; in fact, it would seem that traffic control might permit of the stock of these special goods and passenger vehicles being reduced.

A great advantage is the avoidance of correspondence, as matters are cleared up at once. For instance, a guard reports a train delay; instead of inquiries being made as to the cause, the cause is known before the delay is reported. Other benefits are: In case of an accident, the controller, on being advised, can call for medical aid, if necessary, and the breakdown gang; arrange for any diversion of traffic; cancel trains; provide another engine; dispose of the vehicles of the disabled train, etc. The controller can get hold of any man at any time and can make prompt inquiries on behalf of headquarters.

Coming now to the traffic control to be found on the Great Northern Railway, we would say that two divisions are equipped. One is the Western Division, which has a traffic control office at London Road Low Level station, Nottingham, and the other is the Leeds Division, with an office at the Central station, Leeds. The Western Division has three sections, one taking the area between Grantham North and Trent Lane, Nottingham, a second covering the line between Netherfield Lane and Shirebrook, including the large sorting sidings at Colwick Yard, whilst the third takes from Basford Junction to Burton-on-Trent. The Grantham–Trent Lane section is mostly the main line working between Grantham and Nottingham. The Netherfield Lane–Shirebrook section takes the numerous collieries that lie along the Leen Valley, whilst the third takes the collieries on the Erewash Valley, also Ilkeston, Derby and Burton.

The Leeds Traffic Control Office has four sections. Nos. 1 and 2 take the main line between Leeds and Doncaster, No. 1 covering the boxes between Leeds and Wrenthorpe South—immediately north of Wakefield; No. 2 between Balne Lane Junction, Wakefield, and Doncaster; No. 3, Leeds to Halifax, *viâ* Bradford, to Keighley and the Shipley Branch. No. 4 takes the Gildersome Branch, *i.e.*, from Ardsley on the Leeds–Wakefield line, through Morley and Pudsey, to Bramley on the Leeds–Bradford line, and the Batley Branch from Wrenthorpe, on the Leeds–Wakefield line, to the Gildersome Branch at Drighlington.

Between Leeds and Wrenthorpe South inclusive there are 18 points of communication and, in addition, No. 1 section takes the Methley Branch, which begins at Ardsley, on the Leeds–Wakefield line, ends at Methley, where the Methley joint line joins the Lancashire and Yorkshire and has six points of communication upon it. No. 2 section begins at Wrenthorpe, where No. 1 section leaves off, and goes to Decoy Up Yard, on the south side of Doncaster. It has 23 points of communication. No. 3 section starts from Wortley South signal-box, which is the next box to Holbeck on the Leeds–Wakefield line, and passes through St. Dunstan's—for Bradford—to Halifax. There are 21 stations or signal-boxes on this length. The same man also takes the Keighley Branch, which begins at Queensferry East box, on the Leeds–Halifax line, ends in the Great Northern goods station at Keighley, and has seven stations. The Shipley Branch is also in No. 3 section. It starts at Laisterdyke, on the Leeds–Bradford line, has four stations, and ends in the Great Northern passenger station, Shipley. No. 4 section takes the lines—one can hardly call them branches, although they are officially designated as such—lying to the west of the Leeds–Wakefield line and the Leeds–Bradford. One is the Gildersome Branch, which starts from Ardsley, about midway between Leeds and Wakefield, has 15 stations, and ends at Bramley West, on the Leeds–Bradford line. The other is the Batley Branch, with 13 stations, which begins at Wrenthorpe, passes through Ossett, and joins the Gildersome Branch near to Drighlington.

Whilst we have, thanks to the courtesy of the Great Northern Railway, had an opportunity of inspecting both the Nottingham and Leeds installations, our visit to the latter station was of the more recent date, and we propose to base our description of the Great Northern Traffic Control on what is to be found at Leeds. Both installations are practically the same, as may, in part, be judged from our photographic reproductions.

In each case there is the customary large diagram of the running lines, loops, junctions, refuge sidings, private sidings, stations and yards controlled. At each signal-box is shown the number of wagons, without engine and brake, that can be accommodated in the

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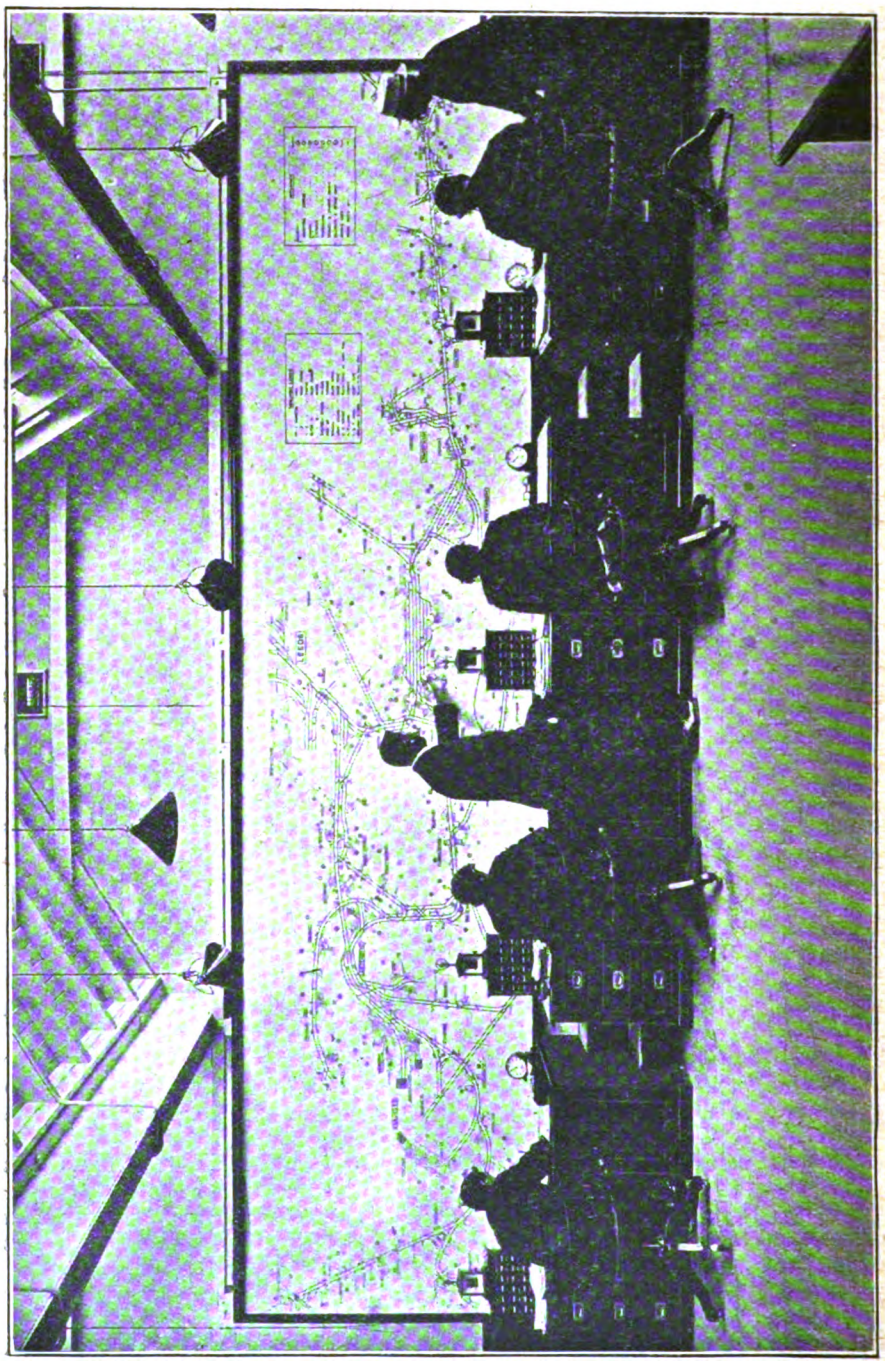

LEEDS CONTROL ROOM, GREAT NORTHERN RAILWAY.
(Western Electric Company's System of Traffic Control.)

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various loops and sidings. This is done by marking the number in a circle. The circles applicable to the usual accommodation sidings at stations are coloured blue; those for refuge sidings are coloured red, private sidings have a circle lettered P.S., whilst those for loops are lettered Loop. In addition, there are other circles for exchange sidings, marshalling sidings, storage and loading docks and reception lines. These circles are to be seen, besides the lines in the diagram, and each is connected on the diagram to the siding or loop it applies to by an arrow.

The system employed by the Great Northern is that of the Western Electric Company, which was described in *The Railway Gazette* some time ago, when it was installed on the Rhymney Railway. Since then it has been put into operation on the whole of that system, also on the Taff Vale. It is also to be found on the Great Central.

On the Great Northern, each sectional controller has a desk, as seen in the illustration, also a telephone with head gear receiver and chest transmitter. A single pair of telephone wires is run throughout his section. On the left-hand side of the desk is the selector key cabinet, containing, in this particular instance, 24 selector keys—there could be 36 or even 48 were it considered necessary. For each of the points in the sectional controller's area there is a selector key, and each key is different in its work to every other key in the same selector case. Each key consists of a simple clockwork mechanism which, when given a half-turn and then released, returns to its normal position. During its return it rotates a toothed wheel, the teeth of which press against one spring of a pair of springs. As each tooth passes the spring nearest to it is put into contact with the other spring, and they separate as they come opposite to the root of the tooth. The two springs are in series with a battery and relay, which latter operates correspondingly with the impulses of current caused by the rotating toothed wheel. The contacts of the relay are connected to the line and a large battery, so that impulses of current are sent out to the line.

A special feature of the selector keys is that normally the keys rest so that the contact springs are separated. The first tooth is much thicker than the remainder, with the result that while the spring is riding over the first tooth current is flowing for some appreciable time. The remaining teeth are quite narrow, allowing only a momentary current to flow. At the side of the toothed wheel is a metal shield, the edge of which is level with the tops of the teeth. This shield is adjusted to cover a pre-determined number of teeth, *e.g.*, if five impulses are to be sent, all are covered beyond the first five. On being operated, the springs first come in contact, owing to the first tooth being much thicker, for an appreciable time, then they break and make for the requisite number of impulses, say five, and afterwards they are kept in contact by the shield for the rest of the wheels' rotation, at the end of which they separate and remain apart.

The relay responds exactly to these movements and corresponding current impulses are sent out to the line.

At each of the calling points there is a special telephone bridged across the telephone wire, together with a selector set and a powerful battery ringing bell. The selector consists essentially of two electro-magnets, each operating an armature. Each armature operates a lever and pawl which, in turn, rotates a toothed wheel fitted with a contact. The wheel is fitted with a light spring, which causes it to return to a set position as soon as it is free from the levers mentioned. One of the electro-magnets is slow acting and does not respond to the current impulses, but simply pulls up and holds, so long as impulses are being sent along the line, the toothed wheel so that it cannot return until the current impulses have ceased, causing the armature to fall back. The quick-acting magnet, on the other hand, responds to the impulses, and its lever pushes the toothed wheel forward one tooth per impulse. Thus, at the fifth station to which five impulses are sent the toothed wheel is given five movements, at the end of which a local bell circuit is closed and the bell is rung. The bell will not ring at any other time, and it will therefore be seen, without further explanation, how, by giving each calling place a separate and distinct number of impulses that place and no other can be reached, and that within five seconds of the controller turning the specified selector key.

The telephones at the stations are practically in two distinct parts—the speaking part and the listening part. Normally, it is in a condition for listening. Should a station wish to speak to the controller, the man will take off the receiver, listen if the circuit is in use, and, if not, press in the speaking button.

In the event of a sectional controller having to leave his desk, the removal of his

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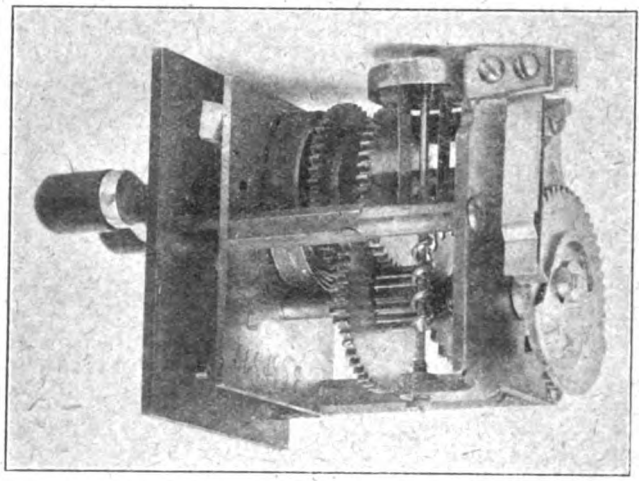
headgear automatically switches across his line a loud-speaking receiver, which will call the attention of the controller's colleague. This man will then plug his telephone across his colleague's line and take the call.

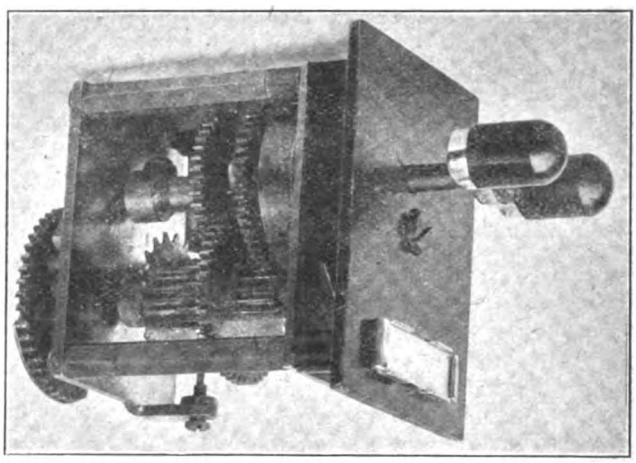
length. The space for each train is headed "Train No..... Working No..... Engine No..... Class....." Below this is printed "Time Arrive. Time Depart. Wagons. Remarks." An entry is started as



SIDE VIEW OF SELECTOR KEY SHOWING SHIELD ON LOWER SIDE OF TOOTHED WHEEL.

Each controller has in front of him a sheet on which is shown the movements of every train, except passenger trains, then working on his section. No. 1 man at Leeds, for

soon as a train is about to enter the area controlled, from which remark it will be gathered that each controller is warned by an adjacent controller when a train is



END VIEW OF SELECTOR KEY.

instance, has a sheet headed "Leeds to Wrenthorpe," which provides for 12 trains —four trains in a row and three rows to a sheet. Down the centre of each row is printed the names of the 16 boxes in that

approaching, so that preparations may be made to receive it. When a train is coming from an uncontrolled area, *e.g.*, from south of Doncaster, an advice is sent that at about a certain hour a particular train with a load

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of approximately such a number of wagons will enter the area, bound for a certain destination. Then when the train enters the area the entries opposite the signal-boxes begin. The first man reports the arrival and, in due time, the departure, together with the number of wagons the train has on. These are duly entered by the sectional controller on his sheet, and any remarks as to delays, special loads, unusual incidents, are added.

In addition to the record on the sheet, the controller has a visual record before him on the diagram. Each train, as it enters the area, has a ticket given it about 1 in. square. There are 13 examples of tickets in order to suit the class of train, and each class is coloured differently. As soon as the arrival of a train is reported at a station, a corresponding label is pegged to the station's position on the diagram. On reference to our illustrations, many of the tickets will be seen. It may be added that the pegs holding the tickets are lettered with the hour the train arrived, from the hour to the half-hour has a blue head and from the half-hour to 59 min. past a red head. Thus 10.20 has the number 10 on a blue ground, whilst 11.45 has 11 on a red ground. Similar tickets are also used for recording when a loop or a siding is occupied and with how many wagons. If it is a full train, then it is added whether or not the brake is there.

The traffic on hand is watched by the sectional controller, receiving at 8.30 a.m., 12 noon and 5.30 p.m. each week-day from the principal points on his area particulars of the traffic on hand. No. 1 has eight such places, No. 2 has seven, No. 3 has ten, and No. 4 has nine. These are recorded on a sheet and the variations watched by the sectional controller, who is responsible for seeing that the traffic is worked away and that the supply of empty wagons is kept up.

In addition to the sectional controllers, there is another whose duty it is to watch the men's hours. Every man is recorded by this controller as he starts on a journey, and towards the end of eight hours or so the controller makes inquiry from the other controllers where the man is and what are the chances of his completing his trip within the 10 hours. If that is unlikely, then the controllers arrange the traffic so that the man's journey is expedited or that relief is sent. In the latter event, the relieving station is told where the man is, and word is sent to the man that he will be relieved at a specified place at a certain time, and he is told what steps he is to take to get home. By this means there is no need at all for trainmen to telegraph for relief—a factor which saves inconvenience and uncertainty to the men, and gives less work to signalmen and telegraph clerks.

Each relief controller has, for his turn of duty, a sheet showing the number of men who needed relief, the number relieved, the number not relieved because of scarcity of men, those who were relieved by exchanging trains with other men, and those who were relieved by their trains being cancelled.

The office at Leeds is particularly well lighted. It has a weaving-shed roof, with the glazed portions facing the north.

In conclusion, we would say that whilst all the companies who have adopted Traffic Control have found it to be productive of great economies in engine mileage and in the avoidance of overtime, in no case has greater success been achieved in this direction than on the Great Northern.

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A Railway's Fight with Coast Erosion.

DUBLIN AND SOUTH EASTERN RAILWAY ENTERPRISE.

ONE of the most interesting chapters in the annals of Irish railroads is furnished by the history of the Dublin and South Eastern Railway, or to give it its older and better known title, the Dublin, Wicklow and Wexford Railway.

The development of the system in spite of great natural difficulties is much to the credit of the country, and every Irishman feels an interest in this old and popular line, which runs through matchless scenery both of woodland and sea. Owing, however, to the proximity of the line to the seashore, the company have for years past had a hard struggle to keep the most exposed portions intact, and the fight against erosion has seriously impeded the activities of the company. A relentless sea has eaten into the coast-line between Bray and Wicklow to such an extent as to make it impossible to continue the present route much longer. Everything that human ingenuity could devise to withstand the ravages of the waves has been tried, but it is obvious that other means must now be sought. It is no use carrying on the patching policy much longer, as it will result in the end like the labours of Sisyphus. The directors and officials of the railway company have not been oblivious of the danger that threatens their system. They have carefully worked out plans by which in future the sea can be set at defiance, and it will not be long, it is hoped, before all these plans will be carried out. Already two important works have been finished.

New Tunnel at Bray.

The first of these is the diversion of the line a little to the north of Bray Railway station. The second is a much more onerous and important one. It consists of the making of a tunnel, 1,100 yards in length, between Bray and Greystones, and a long stretch of new permanent way. The third portion of the scheme embraces the transference inland of the entire line from Greystones to Wicklow, an operation which, it is hoped, will be carried out by the Government. The scheme is being considered by the Government, who have already given recognition to the national importance of the system in the form of a grant of £10,000, to be devoted to the protection of some of the worst portions of the line during next winter. The cost of shifting the line for a distance of eleven miles is estimated at £250,000. It is evident that this work must be carried out not only to preserve this important link, but to give transit facilities to the agricultural and industrial portions of Counties Wicklow and Wexford, whose products are yearly becoming more valuable to the nation. The directors of the company are in negotiation with the Chief Secretary, who has shown himself in sympathy with the project, and at his suggestion an inspection was recently made by Sir Maurice Fitzmaurice on behalf of the Board of Trade. The fact that the grant of £10,000 was sanctioned within a fortnight of his visit is regarded as significant.

At the moment, the completion of the new tunnel is the most gratifying feature of the scheme. Mr. Frank Brooke, Chairman of the company, his co-directors, and the principal officials inspected the tunnel this summer, when they found the work so advanced as to be able to fix the first week in December for its opening for traffic. A private inspection was made recently by a party of journalists, including a representative of *The Irish Times*, accompanied by Messrs. John Coghlan, General Manager; Mr. C. E. Moore, Chief Engineer; and Mr. W. H. Hinde, M.Inst.C.E., the contractor. The tunnel, the northern entrance to which is a short distance from the third tunnel at Bray Head, is 1,100 yards in length. It was begun in October, 1913, and the hard rocks, especially white quartz, necessitated the use of drills driven by air pressure. Boulder clay also gave much trouble, and here it was necessary to employ heavy timbering to support the roof. The contract was first undertaken by Messrs. Naylor, who started the Greystones or southern end, but after completing about 500 ft. they had to relinquish the contract owing to the war. The work was then taken over by Mr. Hinde, who started at the Bray end. A ventilating shaft was sunk in the middle, with a diameter of 9½ ft., and a depth of 100 ft. The tunnel is 15 ft. high, and about the same dimension in width. The side walls are lined with masonry, and the arch with brick. The tunnel, which is the longest on the company's system, runs almost parallel with the existing line. Great difficulty was experienced in the southern end owing to a large volume of water being encountered. Miners from England had to be employed, but several Irishmen have been trained by Mr. Roberts, who is in charge of the mining operations, and have proved themselves to be first-class men. In spite of the dangerous nature of the work there has been no accident in the tunnel. The alignment of the tunnel, and the stretch of the permanent way beyond it, have been accurately maintained, so that the new line approaches to within a few inches of the old one near the harbour bridge at Greystones.

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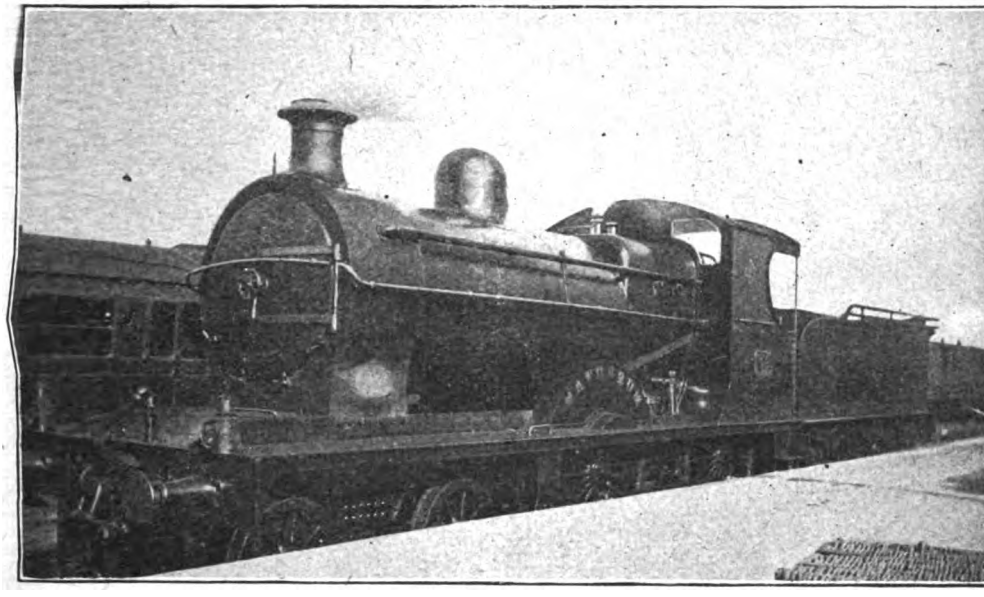

Photo] [*T. Grove White.*

DUBLIN AND SOUTH EASTERN RAILWAY.
Express Engine No. 58, *Rathdrum.*

Protection of the Line.

The completion of this exacting undertaking, in spite of the difficulties created by the war, is a great tribute to the zeal and determination of the company to develop the system to its utmost capacity, and advance the interests of the country generally.

The efforts to protect the line from Greystones to Wicklow will be watched with interest. Between these points the railway runs over a sandy beach, which offers little resistance to the fierce north-east winds, with the result that, sometimes in the winter, portions of the line are wrenched from their fastenings and carried inland. At the close of last year a violent storm caused mush havoc at Ballygannon and Kilcool, two of the most exposed spots on the system, and one may still see the effects of the damage in smashed walls and layers of sand and shingle washed from the foreshore across the tracks. Special precautions are being taken to guard against a repetition of the damage in the coming winter. A breakwater is being built for a few miles along the sea-front, and for this purpose rocky boulders are being brought from quarries at Bray Head, the Three Rock Mountain, Rathdrum, and Aughrim. Long rows of wooden piles, to preserve the foreshore against the deadly combination of wind and wave, have been driven into the sand. In other ways, too, the summer months are being utilised to prepare for the worst that may happen during the winter gales. Gangs of men are busy at the defence works, and everything that human foresight could suggest is being done to obviate further erosion. It certainly will not be the fault of the company, says *The Irish Times*, to which newspaper the Railway Magazine is indebted for the foregoing particulars, if nature, in her angry moods, does further destruction to the line.

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PERTINENT PARAGRAPHS

Our Colour Plate.

FRONTISPIECE of this month's RAILWAY MAGAZINE represents the afternoon West Coast express from Liverpool and Manchester to Glasgow (prior to the recent alterations) approaching Tebay Junction, in Westmoreland, at full speed, headed by the 4-cylinder 4-6-0 "Claughton" class engine, No. 1161, *Sir Robert Turnbull*. There is some physical resemblance between the stretch of line on which this picture was taken and that on which the Great Eastern express appeared near Audley End in last month's plate, in that this also is a "breathing space" between two stretches of hard climbing. But the London and North Western climb is by far the more arduous ascent of the two, beginning as it does with 13 miles of continuous up-grade from Milnthorpe past Oxenholme to Grayrigg, and continuing, after a level or slightly falling stretch of 5 miles from Grayrigg to a point near Tebay, with another 5½ miles' "pull" to Shap Summit, the last four of which are at 1 in 75. During this ascent the train is lifted from but little above sea level to an altitude of 914 ft., among the Westmoreland Fells. The express in the picture is approaching Tebay at a speed of about a mile-a-minute, which will probably be reduced to something but little over 20 miles an hour before the summit is "topped." This is one of the finest scenic stretches on the whole of the West Coast Route, south of the Border, as the train ascends the deep valley of the Lune between Low Gill and Tebay: the steeply sloping mountain side is seen on the right of the colour print.

Locomotive Livery.

A FURTHER change in the livery of the Great Western Railway locomotive has now to be recorded. Since July the polished copper rims on the chimneys of the rebuilt locomotives with modern boilers have disappeared under a covering of black paint. As all students of locomotive design are aware, the chimney is a very distinctive feature, and any modification does much to alter the appearance of a type. The effect of this alteration, fast becoming general, is not so unpleasing as might be expected. This is not the first appearance of plain black chimneys on the Great Western. In the late "nineties," the 4-2-2 locomotive *Courier*, No 3003, was experimentally fitted with a cast-iron chimney. A plain cast-iron chimney was introduced with the advent of the "Camel" type of 4-4-0 locomotives in 1899. For some time it remained the standard, and was fitted to the "Atbara" and "City" classes, the 2-6-0 4 ft. 7½ in. goods class, and the various classes of modern tank engines, the $\frac{2\text{-}4\text{-}2}{T}$, $\frac{2\text{-}6\text{-}2}{T}$, and $\frac{4\text{-}4\text{-}2}{T}$ types. The copper-capped chimney, which had a greater diameter than the cast-iron pattern, remained the standard for the "Atlantic" 4-6-0 and 2-8-0 engines. Some of the earlier "County" class had the copper-capped chimney, and others the cast-iron pattern. By 1908 the work of reinstating the copper-capped chimney on all classes of Great Western locomotives was well in hand; and since that year it has been fitted to all new engines built by the Company. As predicted last month, the painting of the brass safety-valve covers on this railway's modern locomotives is being continued.

London "Safety First" Council.

THIS council, of which Mr. H. E. Blain, Operating Manager, of the London Electric Railways, has since its inception been one of the driving forces, is now well-embarked on its particularly useful career.

At a recent meeting of the Council the Drivers' Educational Committee recommended the promotion of a "Freedom from Accidents Competition" upon the following conditions:—

(1) The competition is to be known as the "London 'Safety First' Freedom from Accidents Competition."

(2) The object of the competition is to encourage, by the award of money prizes and badges of merit, drivers of all classes of vehicles to exercise every care and discretion in the performance of their duties.

(3) The competition will be divided into three classes, viz.:—(1) Drivers of motor vehicles; (2) drivers of horsed vehicles; (3) drivers of tramcars.

(4) Thirty prizes of 10s. each, together with a first-class badge of merit, and fifty second-class badges of merit, are offered in each of three classes, to drivers whose records, in the opinion of the council, qualify them to receive such awards.

(5) All drivers continuously employed for the period of twelve months from October 1st, 1917, by one or more of the corporations or firms operating in the Greater London

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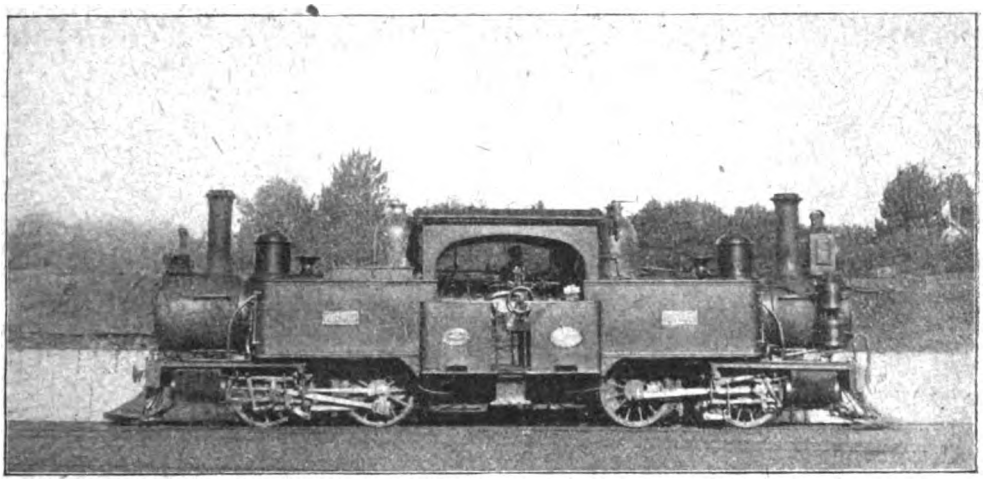

NEW ZEALAND GOVERNMENT RAILWAYS.
Class "E" locomotive, built by Avonside Engine Co., Ltd.

area will be eligible to compete in their respective classes, and intending competitors should at once notify their employers of their desire to take part in the competition.

(6) The competition will commence on October 1st, 1917, and terminate on September 30th, 1918.

(7) Employers must, not later than Tuesday, October 22nd, 1918, send to the honorary secretaries of the London "Safety First" Council, a duly certified return giving the names and addresses of those of their employees who, during the twelve months ending September 30th, 1918, had been free from accidents.

(8) The decision of the London "Safety First" Council on all matters affecting this competition is to be final and binding.

The report was adopted.

Periscopes for Railway Signalmen.

PUBLIC interest in periscopes has been mainly concerned in the use made of these instruments in trench warfare, but the Canadian Pacific Railway has found another use for periscopic apparatus. Periscopes have been installed in the interlocking signal towers at Mile End, Montreal, and at Iberville Junction, on the Montreal–St. John, N.B., line, 30·6 miles east of Montreal, to enable the signalmen to get views of portions of the track adjacent to the interlocking limits, which are obscured by buildings in the direct line of vision. The periscope is located at a window opening, and the mirrors, one at the top and one at the bottom of the upright tube, are adjustable, the adjustment of the bottom mirror being convenient to enable signalmen, when either sitting or standing, to obtain the view. The apparatus was built and installed at each place by the company's own workmen.

Early "Fairlie" Engine in New Zealand.

MR. WILLIAM STEWART, of Auckland, New Zealand, has sent a photograph of a Fairlie type locomotive, of the 0–4–4–0 wheel arrangement, built by the Avonside Engine Company, of Bristol, as far back as 1875, and still at work after 42 years' service. He states that two of these engines, numbered 174 and 176 and classed as "E," are at present running on the New Plymouth section, and are doing good work. It is interesting in this connection to quote the late Mr. Charles Rous-Marten's remarks concerning the use of Fairlie locomotives in New Zealand, from an article which appeared in these columns in December, 1899. "They have not been, as a rule," he said, "successful in New Zealand, because they have seldom been worked in accordance with the inventor's directions. Mr. Robert Fairlie often impressed upon me the necessity of his double-boiler engines being worked with *full loads*, failing which, he said, the advantages he claimed for his method would not be obtained. But it was seldom possible—or, at least, convenient—to give the Fairlie engines their full loads in the particular districts in which they were worked, and, by the time that full loads could have been given them, new engines more in accordance with the prevalent views of the locomotive engineers had been procured." After instancing the difficulty that was experienced in keeping the flexible steam pipes of the bogies tight, and the objections raised by the permanent way engineers to the heavy weight of these engines on the light bridges of that period, Mr. Rous-Marten concluded, "And so the 'Fairlies' are rapidly dying out and going one by one to the scrap-heap." In these circumstances it is remarkable that some, at least, of the engines concerned are still hard at work eighteen years later. They have cylinders 10 in. diameter by 18 in. stroke, 3 ft. 3¾ in. driving wheels, and weigh in working order 37 tons.

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An American Railway and the Food Supply.

SINCE the outbreak of war British railways have in various ways done much to encourage food production and now that the United States of America have cast off neutrality, evidence is forthcoming that American railways are likewise taking steps to increase the output of the food supply. As an effective means of releasing a larger proportion of the food and feed stuffs grown in the South for the use of the armies and navies of the United States and her Allies, the Southern Railway system, in co-operation with the United States Agricultural Department, seed dealers throughout the South, and local bankers and business men, has been and still is carrying out a campaign for the planting by individual farmers of a "fall food acre."

Early in the summer arrangements were made by which the seed houses put up assorted packages of seeds of standard food and feed crops for planting during the months of July, August and September, and which would furnish food and feed for the farmer's family and his livestock in the autumn and winter months. These packages are supplied in quantities by the seed houses to local bankers and business men, who, in turn, sell them at cost to farmers in their communities. The County Agents of the United States Agricultural Department are co-operating in this campaign and aid in the distribution of the seeds and in advising farmers as to the best methods in planting and cultivating.

Owing to the limited supplies of seed available, it will probably be impossible fully to supply the demand for these "fall food acre" packages, and the distribution will necessarily have to stop as soon as the available supplies of seed are exhausted. Mr. Roland Turner, Chief Farm Products Agent, Southern Railway System, Atlanta, Ga., is the railway official responsible for the arrangements.

Safe Railway Travel in the U.S.A.

MR. FAIRFAX HARRISON, President of Southern Railway Company, recently announced that out of substantially 18,000,000 passengers handled by the Southern Railway for the fiscal year ended June 30th, 1917, not a single one was killed. The management, as a consequence, takes the utmost satisfaction in this achievement, which it has sought to attain, and nearly, but not quite, attained for several years past. It reflects, writes our correspondent, not only greater human care and efficiency in operation, but the improved facilities which have been progressively installed on the Southern system in recent years.

The handling of these eighteen millions of passengers required 71,775 trains, composed of the average number of passenger cars seating 72 passengers each; it means 249,780 passenger cars.

If these passenger trains stood end to end on the railroad tracks they would extend for 5,457 miles; more than six times the distance from Atlanta to New York. If one passenger had been carried the total distance that these passengers were carried he would have gone around the world 35,093 times, and had 15,150 miles then to travel.

A Case for the Coal Controller?

THE old story of the crafty suburban householder who supplied himself with fuel by keeping chained to a pole in his garden, a monkey which the firemen on passing goods trains pelted with lumps of coal, is matched by a Scottish story a correspondent has culled from a recent number of the Dundee *People's Journal*.

It was near the station of Auchnagatt, between Aberdeen and Brucklay, that the incident took place. The writer says he took shelter in a cottage from a heavy shower, and states:

> The housewife told me that she had had a "sair fecht" in rearing a family upon a very meagre income. A pile of coal in a corner caught my eye, and I remarked that, at all events, she was well provided with fuel.
>
> "Ay, bit we get that for naething," she explained. "Fin the trains is passin' wee Peterie rins oot an' mak's mou's at the engine-drivers, an' they fling as mookle coal at him as we can burn!"

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WHAT THE RAILWAYS ARE DOING

MR. R. F. DUNNELL (Secretary and Solicitor of the North Eastern Railway) has, with the approval of the directors, accepted the appointment of Temporary and Additional Assistant Secretary of the Admiralty. Mr. Dunnell, admitted a solicitor in 1891, and in the same year was appointed upon the staff of the Solicitor's Department of the North Eastern Railway as one of the assistants to the Solicitor. Mr. Dunnell was appointed Assistant Solicitor in 1899, Secretary in 1905 and Solicitor in 1906. He held both positions, and was also Chief of the North Eastern Railway's Rates and Taxes Department, which is incorporated with the Legal Department.

* * *

ON the occasion of the recent royal visit to the Grand Fleet, Mr. Charles H. Stemp, the Operating Superintendent of the North British Railway, was personally thanked by His Majesty the King, not alone for the arrangements carried through on the North British Railway in connection with the journey, but also on account of the very favourable reports he had from the Naval authorities on his visit to the Fleet there, as to Mr. Stemp's services rendered in connection with railway matters affecting the dockyard. Mr. Stemp was presented with a diamond scarfpin as a souvenir.

* * *

OFFICIALS and staff of the Taff Vale Railway have made a presentation to Mr. T. E. Harland, the late Superintendent of the Line, and also to Mrs. Harland. The former received two silver candlesticks, silver inkstand and a case of pipes, whilst Mrs. Harland received a gold wristlet watch. The silver bore the inscription: "Presented to T. E. Harland, Esq., late Superintendent of the Line of the Taff Vale Railway, by the stationmasters, inspectors and chief clerks on his retirement, July 31, 1917." Mr. Oscar Hurford, the oldest outdoor official of the company, presided, supported by a large number of officials of the line. The presentation to Mrs. Harland was made by Mr. C. Edmunds. Mr. Harland, in making his acknowledgments, said for some time past much of his work had been undertaken by Mr. E. H. Dennett, who had taken a heavy responsibility, and he suggested that Mr. Dennett would fill the post with credit to himself and to the satisfaction of all parties concerned.

* * *

Photo [*C. Vandyk.*

MR. R. F. DUNNELL,
Temporary and Additional Assistant Secretary of the Admiralty.
(Secretary and Solicitor, North Eastern Railway.)

AT the recently held annual meeting of the Furness and Barrow branch of the R.S.P.C.A., the thanks of the Society were accorded Mr. Alfred Aslett, Secretary and General Manager of the Furness Railway, and Chairman of the local branch of the Society, for his "great work" on behalf of the Society. Mr. A. Gordon Jones, who spoke on behalf of the Society, said Mr. Aslett was a particularly busy man, "but never too busy to find time for good work."

* * *

SECOND Lieutenant G. D. Petrie, of the Norfolks, who is the youngest son of Mr. J. J. Petrie, Traffic Manager, Midland and Great Northern Joint Railways, King's Lynn, has recently been wounded in the left arm while leading his platoon in the advance against the German lines. He had previously been wounded in the Gallipoli campaign.

* * *

A SUBSTANTIAL addition to the hotel accommodation of Birmingham has been made by the opening of the new Queen's Hotel. For some considerable time the London and North Western Railway has been unable to meet all the demands for hotel accommodation, and the work of extending the Queen's has been going on for over three years. The new building is furnished and equipped in the most up-to-date fashion. On the ground floor are three panelled rooms of fine proportions—a dining room, a

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lounge, and a smoke room. On the first floor is another capacious room, oak-panelled, which will be available for public dinners and meetings. The extension more than doubles the bedroom accommodation hitherto provided.

* * *

NOTHING succeeds like success, and success beyond all expectation attended the second annual sports meeting of the Metropolitan Railway War Service Corps recently held at Wembley. Fully 6,000 people assembled in perfect weather, and the whole function went off without a hitch. The fête was held with the threefold object of (1) entertaining 100 wounded soldiers; (2) enlisting recruits for the corps; (3) raising money to send gifts and comforts to Metropolitan Railway staff who have joined the military and naval forces, particularly those who are prisoners in enemy hands. At the close of the competitions Mr. R. H. Selbie, the General Manager, Mrs. Selbie, and many others mounted the platform in the centre of the arena for the prize distribution. Mr. R. H. Selbie, who was received with loud cheers, congratulated the War Service Corps upon the wonderful success of the sports and in the course of his remarks reminded his hearers that there are over 1,000 men of the Metropolitan Railway in the Army. Mrs. Selbie, who distributed the prizes, was very warmly received.

* * *

IN connection with the transport of American troops from London to an unmentioned destination *The Daily Telegraph* paid a well-deserved compliment to British railways as a whole and to the London and South Western Railway in particular. It said: "Everybody agreed the work of getting the troops off was discharged in a manner which told that we surely have the finest system of railways of transportation in the world. The arrangements were a model of perfection."

* * *

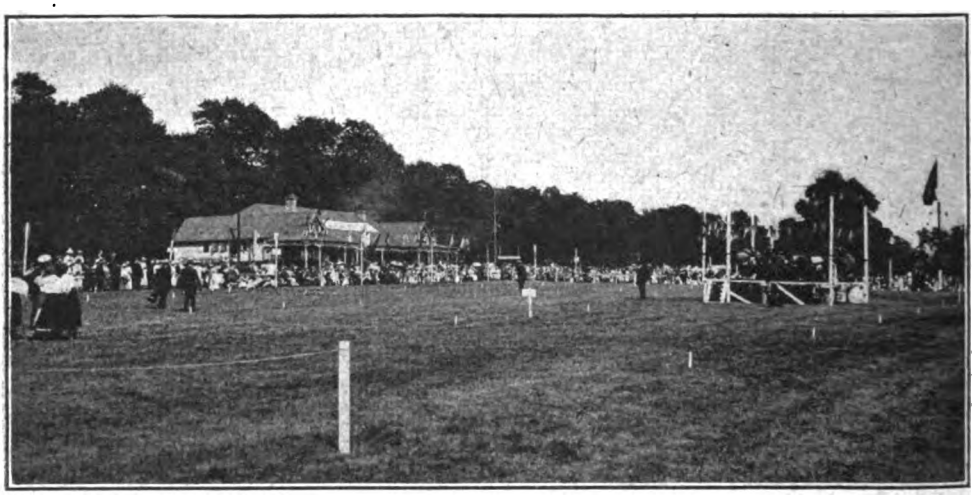
THE London, Brighton and South Coast Railway has arranged with Messrs. Carter, Paterson and Co. for the delivery to destination within the London district of any luggage handed in at the parcels offices at their London termini after the arrivals of the trains. To facilitate the delivery each package should be fully and legibly addressed.

* * *

CERTAIN alterations to the codes for London, Brighton and South Coast Railway engine headlights and boards have been recently made. The lights are now white, not coloured, and the headboard is of circular pattern, 15 in. in diameter and painted white. There are six different positions giving an almost unlimited number of combinations.

* * *

SEVERAL pleasant autumn evening gatherings are promised at the Railway Club, 92, Victoria Street, London, S.W.1. The club, as RAILWAY MAGAZINE readers are aware, is open every week-day, but general meetings of members take place at 7 p.m. on the second Tuesday in each month. On September 11th the business meeting will be followed by an exhibition of railway photographs and postcards; on October 9th Mr. A. W. Bartlett will read a paper entitled "The Drummond Engines of the London and South Western Railway; and on November 13th there is to be an exhibition of lantern slides under the direction of Mr. J. B. Sherlock. Non-members who would like to be present on any one of these occasions should write to



METROPOLITAN RAILWAY WAR SERVICE CORPS SPORTS.
A general view of the ground.

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Mr. E. J. Miller, Hon. Sec., enclosing a stamped and addressed envelope.

* * *

MR. J. E. SHARPE,
London and South Western Railway.
1917 Brunel Medallist, London School of Economics.

MEMBERS of the London and South Western Railway staff who distinguish themselves in any way may always rely upon the keen appreciation of the company's officers and their fellow workers. Among the latest to gain credit in this way is Mr. J. E. Sharpe, who is employed in the office of the Assistant Superintendent of the Line. His portrait appears on this page. Mr. Sharpe has gained a first-class certificate at the London School of Economics, the subject being, "Commercial." Mr. Sharpe has previously obtained "firsts" for "Operating" and "Law of Carriage," and with his present success wins the "Brunel Medal," awarded to students who have gained first-class certificates on three subjects, being the sixth London and South Western man to achieve that distinction.

Mr. J. Rogers, goods department, Nine Elms, has obtained a first-class certificate, the subject being "Operating," and second-class certificates on the same subject have likewise been obtained by Messrs. J. A. Durham and P P. Willis, London District Superintendent's Office, London and South Western Railway.

* * *

IN aid of the St. John Ambulance Brigade Hospital in France and funds of No. 1 District Corps, the South Eastern and Chatham Railway Centre of the St. John Ambulance Association, has arranged a grand concert to be held at the Wesleyan Central Hall, Westminster (opposite Westminster Abbey), at 7 p.m. on Saturday, September 1st, 1917. A number of eminent artistes have been engaged and prices of admission range from 6d. to 2s. 6d., exclusive of entertainment tax. The latter sum secures a reserved seat. RAILWAY MAGAZINE readers desiring to be present should communicate with Mr. E. A. Richards, South Eastern and Chatham Railway, London Bridge Station, S.E.

* * *

IN reference to a paragraph on page 120 of the August RAILWAY MAGAZINE, concerning "Longest intervals between railway stations," Mr. D. B. Bradshaw points out that a new station at Kildangan—6¾ miles from Kildare—now intervenes between Cherryville Junction and Athy.

* * *

ALTHOUGH at present serving with the British Army in the field in France, Mr. P. E. Prior—one of our direct subscribers—is anxious through the medium of the RAILWAY MAGAZINE to get into touch with someone who can inform him on the various branches of work done in the time-table department of any large British railway. Letters received at the RAILWAY MAGAZINE office for Mr. Prior will be forwarded.

* * *

THE annual inspection of the gardens on the Underground Railways by a committee of directors, assisted by officials, has just taken place. Having regard to the national importance of food production this year, in addition to the customary flowers, vegetables of decorative kinds have been included on the station gardens and allotments wherever possible. So excellent have been the results obtained by the staff that it has been decided to award prizes totalling £27 10s. The awards have been distributed as follows:—First prizes of £3 each to Northfields, South Kensington, Walham Green; second prizes of £2 each to Acton Town and Boston Manor; six third prizes of £1 each, and 17 fourth prizes of 10s. each have also been distributed to other stations. Further prizes aggregating £25 are offered to the staff for the best collection of vegetables grown by them either on or off railway property.

* * *

RECENTLY Sir Herbert Walker, General Manager, London and South Western Railway, issued to the employees of the line a circular expressing appreciation of the various suggestions which had been made by numbers of the staff in the direction of the more economical use of stationery. The suggestions deal largely with envelopes, stencil notices and correspondence, and are set out in the circular for general adoption as far as possible. An instruction is also given that certain articles, including brown paper, scribbling paper, foolscap, sealing-wax, office knives, erasers, stout string, guard books, and letter copy-books, cannot be issued except under special circumstances, supplies of these items being now very hard to secure. There has also recently been a great difficulty in obtaining the needful supply of tickets, and to economise cards an arrangement has been made at certain stations whereby, instead of a whole ticket being

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issued for a single journey, half tickets only shall be issued, two single tickets being printed on one card, and divided by the issuing clerk. This is an excellent example of economy.

* * *

FURNESS Railway directors, at their meeting August 10th, declared interim dividend at rate of two per cent. per annum on ordinary stock half year ended June 30th, 1917, carrying forward £14,286, compared with two per cent. per annum for the corresponding period 1916, £7,455 carried forward.

* * *

WITH commendable energy a considerable number of the London and South Western Railway staff have this year been putting in their spare time on their allotments and gardens, and at nearly every station, from Waterloo to the West, results of their labours are to be observed. There were two stimulants for this effort, first, the necessity for an increased food supply which became plainly evident during the early part of the year; and then, the encouragement given by the Company, in offering available plots along the line free of charge, supplying seed potatoes at a very cheap rate, arranging for spraying of the crops, etc., and appointing a Garden Plots Committee to give special attention to the cultivation. Now under the auspices of the Directors, General Manager and Chief Officers, who have personally given the prizes offered, a Vegetable, Fruit and Flower Show will be held at the Brunswick Institute, Vauxhall, on Wednesday, 5th, and Thursday, September 6th, 1917. At first it was hoped that growers from all parts of the system might be invited to compete, but this has been found to be impracticable for the present year, and consequently the arrangement will be limited to the London and suburban area within 30 miles of Waterloo station. Employees of the London and South Western Railway and their wives and daughters, residing or employed within the radius specified, are invited to compete. On this page is illustrated a potato-spraying demonstration at one of the London and South Western Railway war gardens near Durnsford Road power house.

LONDON AND SOUTH WESTERN RAILWAY.
Potato-spraying demonstration at a railway war-garden near Durnsford Road Power House.

* * *

A READER in Scotland, Mr. Albert Zamorski, Birdston, Kirkintilloch, would like to get in touch with another RAILWAY MAGAZINE reader who can furnish him with particulars of Highland Railway engines and of the 4-6-0 goods locomotives of the Caledonian Railway.

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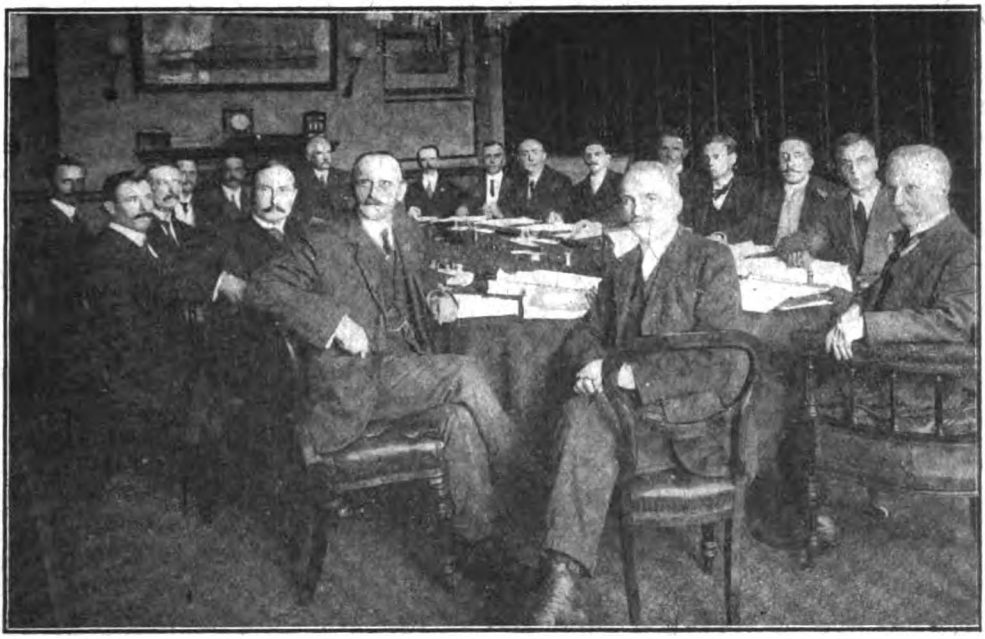

LONDON AND SOUTH WESTERN RAILWAY CENTRAL ORGANISING COMMITTEE FOR NATIONAL WAR SAVING.

The names reading from left to right are:—Mr. J. T. Burge, Southampton West; Mr. G. C. Reeves, Stores Dept.; Mr. A. N. Carter, Goods Manager's Office; Mr. L. A. Harris, Treasurer's Dept.; Mr. A. Hone, Loco. Dept., Eastleigh; Mr. E. Stone, Secretary's Office; Mr. W. Buckmaster, General Manager's Office; Mr. W. H. Crook, Funds Office; Mr. H. M. Abbot, Marine Dept.; Mr. E. Rowthorn, Docks Dept.; Mr. J. Smith, London District Supt.'s Office; Mr. G. J. Tranter, Rating Dept.; Mr. J. C. Northcote, Secretary to Committee; Mr. G. S. Harris, Electrical Dept.; Mr. H. A. Lemon, Solicitor's Dept.; Mr. A. Shepherd, Carriage and Wagon Dept.; Mr. G. R. Davidson, Deputy Chairman; Mr. A. E. Newhook, Chairman.

NATIONAL war saving on the part of the staff of the London and South Western Railway has received highly appreciated and valuable official support and recognition by the company. The Fund office is at Waterloo Station, London, S.E., and the Secretary to the Committee is Mr. J. C. Northcote. The number of local London and South Western Railway War Savings Associations is over 120. On this page is reproduced a photograph of the Central Organising Committee.

* * *

IN reply to Mr. Hope Winstanley in the August RAILWAY MAGAZINE, Mr. H. A. Vallance states that all Mr. Stroudley's "Ventnor" and "Shanklin" singles, London, Brighton and South Coast Railway, have been broken up, the last one having been scrapped in May, 1914.

* * *

REFERRING to Mr. E. L. Ahrons' recent articles in the RAILWAY MAGAZINE on the South Eastern Railway locomotives in the latter part of the 19th century, Mr. E. J. Dorey writes from Herne Bay to say that other interested readers may like to know that Nos. 442 and 445 of the 440 class are working on that section of the South Eastern and Chatham Railway. Both have been rebuilt with domed boilers and circular extended smokeboxes, which considerably alter their appearance.

* * *

FREQUENT requests are received from RAILWAY MAGAZINE readers for lists of London and North Western Railway locomotives. These cannot be furnished quite down to date, but Mr. C. Williams, 73, Chetwode Street, Crewe, states he is still selling his printed list dated 1912 and his supplementary list, 1913, post free, 1s. 1d., inclusive.

* * *

FROM Folkestone a correspondent writes that the South Eastern and Chatham Railway new tank engine, No. 790, is a frequent visitor at the famous Channel port. Early in August she was daily hauling the 8.10 a.m. train which is due at Cannon Street, London, 10.12 a.m.

* * *

Is North British Railway 4-4-0 locomotive, No. 224, the engine involved in the Tay Bridge disaster of 1879 still running? Mr. John P. Brierley requests that this question be put to his fellow RAILWAY MAGAZINE readers, and he continues:—

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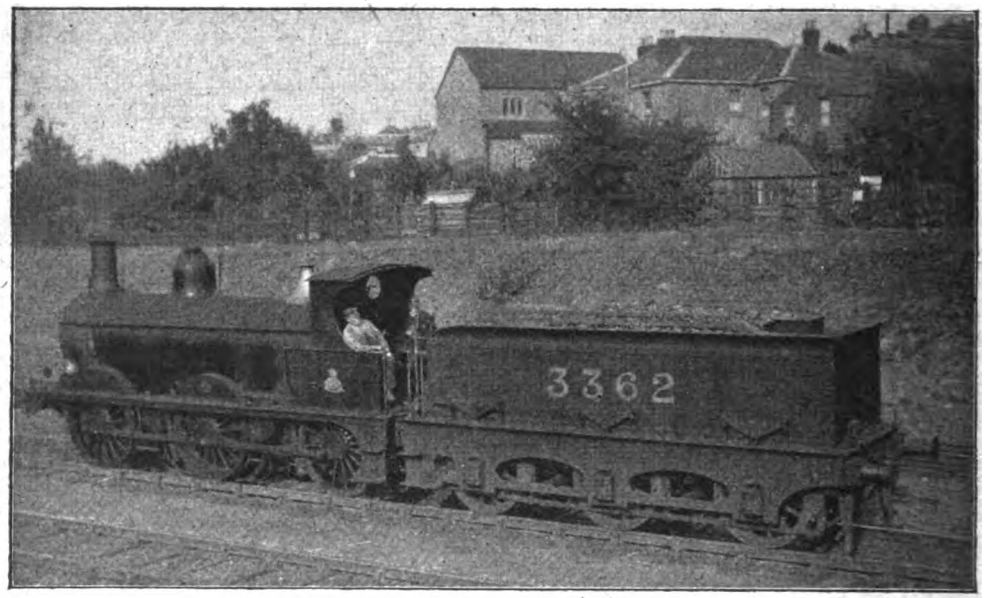
"No. 224 and a sister engine No. 264 were designed by Mr. Wheatley and built in 1871. They had 17 in. by 24 in. cylinders; 6 ft. 6 in. coupled wheels and 1,039·9 sq. ft. of heating surface. The weight of the engine was about 37 tons. They had solid bogie wheels and the dome was placed over the firebox casing. After the Tay Bridge disaster in 1879 she was recovered from the river, repaired and was soon working again. In 1885 No. 224 (but not No. 264) was experimentally rebuilt by Mr. Holmes as a four-cylinder compound. The low pressure cylinders were placed in the usual position under the smokebox, while the high-pressure cylinders were placed in front, over the leading bogie wheels. She was also fitted with Joy's valve gear. In 1887 she was again rebuilt as a simple engine, having not proved a success as compound. Until recently she was still running as rebuilt in 1887, having had quite a remarkable career."

* * *

WRITING from a military camp in the county of Durham, Mr. L. Kelly mentions some items of information he thinks other RAILWAY MAGAZINE readers would like. "A small point," he says, "to note with regard to the large numerals on North Eastern Railway goods engine tenders is that the number plate on cab-sides is replaced by a much smaller rectangular one painted black all over. Some of the F class 4–4–0 engines which have been superheated have been fitted with Pop safety valves. The old casing is cut down half way. With the extended smokebox, chimney well forward and capuchon, these engines have quite an altered appearance."

* * *

FROM Helensburgh, Mr. Ian Perman writes:—"Seeing Mr. T. A. Corbett's query in the August RAILWAY MAGAZINE, and having just come from Dublin, I will endeavour to give him the desired information. On July 24th I paid a visit to the running shed at Inchicore and saw engines Nos. 400 and 341. These two were just in 'hospital,' No. 400 having her superheater steam tubes modified (these having suffered from overheating). Both engines had been there for about a fortnight and would probably be another fortnight before they were on the road again. They are both shedded at Inchicore. I was told that No. 400 often takes the 3 p.m. Cork train from Dublin and returns with the mail train at night. No. 341 has not been taking any particular train. No. 400 has been very successful. Owing to the works at Inchicore being employed for war work, and because of the scarcity of materials, no new construction is being proceeded with, though several engines like No. 400 will be built as soon as conditions are favourable. Several 4–4–0 engines of the '305' class are being rebuilt with taper boilers, several have been running thus for some time and some are at present in the shops. At least one of the 4–6–0 goods engines is now fitted with an extended smokebox and looks quite imposing. I was told that No. 400 had done the 77 miles from Kildare to Limerick



Photo] [*A. B. MacLeod.*

MIDLAND RAILWAY.

0–6–0 locomotive, No. 3362, in the sidings at Cheltenham.

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Junction in 72 min. with a heavy train, and had done the 166½ miles from Dublin to Cork in 3¼ hours, with three stops—presumably these were special tests. These times are, however, unofficial."

* * *

In response to the question dealt with in the foregoing paragraph, Mr. J. J. Allen, Dublin, has supplied the following information concerning Great Southern and Western Railway engines No. 400 (4–6–0) and No. 341 (4–4–0). He remarks: "No. 400 (4–6–0) is shedded at Inchicore, and works all the important fast main line passenger specials and the up and down expresses. She has never refused a train yet, and pulls loads of 25 and 26 coaches without a pilot from Kingsbridge without exertion over a gradient 1 in 80. At the Cork end the gradient is even more severe, being 1 in 50, and is situated in a tunnel, where the rails are always very greasy. Following table gives a fair impression of her runs:

Monday	..	Down	.. 9.15 a.m.
Tuesday	..	Up	.. 12.45 p.m.
Wednesday		Down	.. 3. 0 p.m.
Thursday	..	Up	.. 3.55 p.m. (mail)
Friday	..	Wash-out	..
Saturday	..	Down	.. 9.15 a.m.
Sunday	..	Up	.. 2.30 p.m. (mail)

No. 341 (4–4–0) is also shedded at Inchicore, and pulls 25 coaches, but when the load is heavier she requires a pilot as far as Clondalkin at the Dublin end and to Blarney at the Cork end. Her runs are generally as follows:

Monday	..	Down*	.. 7.35 a.m. (mail)
Tuesday	..	Up†	.. 3.55 p.m. (mail)
Wednesday		Down	.. 6.40 p.m.
Thursday	..	Up	.. 12.45 p.m.
Friday	..	Down	.. 3. 0 p.m.
Saturday	..	Up	.. 3.55 p.m. (mail)
Sunday	..	Wash-out	..

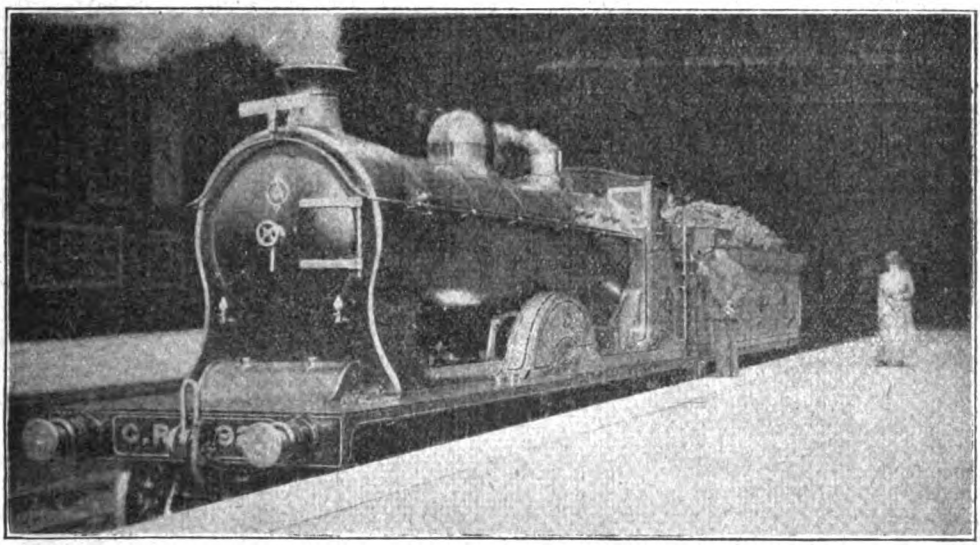
*Down—From Dublin.
†Up—From Cork."

Several other Irish readers have furnished particulars concerning these two locomotives, and thanks are due to all.

* * *

In reply to Mr. Niven's question in the August Railway Magazine concerning Mr. S. W. Johnson's 4–4–0 Midland Railway engines, Mr. John P. Brierley remarks:—

"These engines rank among the oldest 4–4–0's in the country and were built and numbered as follows: 1312–1321 in 1876, 1327–1331, 1333–1345 in 1877. Nos. 1312–1321 were built by Kitson and Co., of Leeds, and the rest by Dübs and Co. They were renumbered, under the much-needed renumbering scheme in 1907, as follows: 1312–1321 to 300–309; 1327–1331, 1333–1345 to 310–327. With the exception of No. 323, these engines were not rebuilt and the majority are still in service. No. 323 was rebuilt with extended smokebox and fitted with a new boiler of slightly enlarged dimensions but similar to the original. Nos. 307, 309, 316, 315, 324 have, I think, been scrapped. Of the surviving engines Nos. 300-306, 308, 310 were



Photo] [*G. R. Travis-Clegg.*

CALEDONIAN RAILWAY.

Express locomotive at Princes Street station, Edinburgh.

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recently shedded at Liverpool, where they worked the through Midland Railway trains from Exchange (Lancashire and Yorkshire Railway) station to Hellifield and Carlisle *viâ* Blackburn. They generally worked as far as Blackburn, the train being taken on from there by the larger 4-4-0's on the Manchester portion. The others were recently shedded as follows: Nos. 312, 318, 319, 320, 321, 322, 327, 326 at Sheffield; No. 323 at Derby; Nos. 311, 313, 314 at Skipton. The whereabouts of 317 and 325 I do not know. Thus No. 1336 mentioned by Mr. Niven was renumbered 313 and is shedded at Skipton.

* * *

WRITING from Ramsbottom, Mr. E. Cyril Bourne says:—"The electrification of the Bury-Holcombe Brook branch on the live rail system is proceeding apace. Nearly ¾ mile of live rail has been laid; a platform has been erected at Brandlesholme Road halt, and one is in course of erection at Sunny Wood halt. At present the power house at Holcombe Brook is broken down, and trains are run in the following way:—Current (1,200 volts) is supplied from the Manchester line stations; the Holcombe line motor car, and a Manchester one, are coupled together, current is supplied to the Manchester motor car through the overhead bows of the Holcombe motor, which otherwise only acts as a trailer, the other motor doing the work. Last month I saw a Lancashire and Yorkshire 0-8-0 superheater coal engine No. 493, dated Horwich works, 1916. On two occasions lately I have seen one of the 1510 class Lancashire and Yorkshire 4-6-0 engines on a goods train."

* * *

IN reply to a question by "North Britisher" in the August RAILWAY MAGAZINE several letters from well-informed readers have been received, and as there is not space enough in these columns for the insertion of long lists of engine numbers the communications have been forwarded to the questioner. A number of readers have written to know when Mr. Ahrons will deal with the North British Railway locomotives in the latter part of the 19th Century. At the moment no definite statement can be made. It is obvious Mr. Ahrons cannot deal with all the railways at once. The North British engines will be dealt with in due course. In the meantime those RAILWAY MAGAZINE readers who desire to place at Mr. Ahrons' disposal any historical data they possess may do so by addressing him at the RAILWAY MAGAZINE office, but it must be understood he cannot communicate to correspondents, through the post, what he intends to say in future contributions. Readers must have patience until the articles appear.

* * *

A CORRESPONDENT who has been on the Western war front states:—

"The building of railroads at the front is one of those occupations which fall within the non-combatant class, yet when I visited a company of the Canadian Railway Construction Corps we passed through two villages at which Fritz was pounding away. Typical instances of rapid work undertaken by this company were the laying of a new track of 22 miles when the enemy was pushed back. Of that length nearly 5 miles were laid down in as many days. In another case a bridge 140 ft. in length was thrown over a crater between Friday evening and the following Tuesday, and the sight of this work proceeding so irritated the Boche that he shelled the spot nearly all the time. In answer to a question as to the secret of this rapidity, the O.C. said it lay chiefly in the methodical preparation of plans so as to have everything ready for the execution of any task as it came in turn."

* * *

RAILWAY news from Northern Africa is somewhat scarce and infrequent, and the RAILWAY MAGAZINE is obliged to a reader who sends a cutting from a Tangier newspaper concerning the fate of two locomotives. The report states that while placing on board the ferry over the Bu Regreg at Rabat three locomotives required for use on the Rabat-Casablanca-Kaid Tounsi line, two of them fell into the river. One was safely put on board and then an attempt was made to let the other two gently down on to the ferry by the help of another locomotive to act as a drag. The weight and the impetus of the two proved too great for the controlling locomotive, and all three fell into the river.

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LWAY :

lker, K.C.B.

els : 6 ft. 9 in. dia.
; total, 2,128 sq. ft.
veight : 59 tons.
tons. Total : 117 tons.
verall : 63 ft. 4¾ in.

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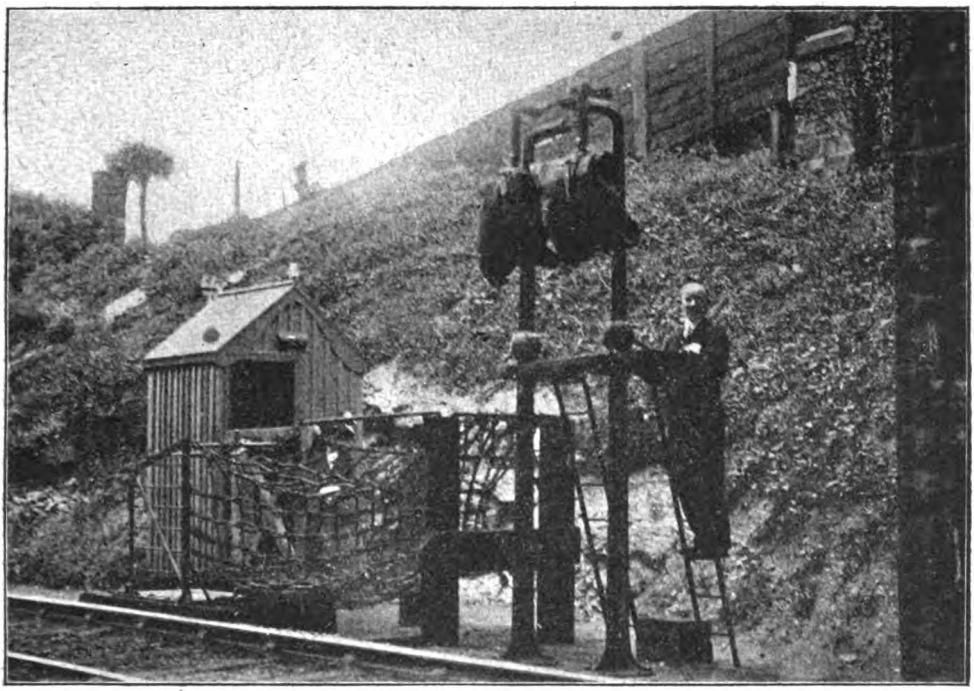

Photo] [*J. Macartney Robbins.*

LONDON AND NORTH WESTERN RAILWAY.
Waiting for the up Irish Mail at Bangor.

The Midland and London and North Western Railways in Wales.

By DENIS O'DONOGHUE.

AT first sight the association of the Midland Railway with Wales is not very apparent, but it is nevertheless very real. The short length of railway running northwards from Swansea, and the line going in a north-easterly direction from Three Cocks to Hereford, detached as they are from one another and both from the Midland's principal system, are not isolated, as they are bound by the working arrangements of the Midland Railway over the intervening railways uniting them, and these arrangements, with the running powers of the Midland Railway exercised over the Great Western Malvern and Hereford line, serve to give through Midland Railway communication from its main system to the Swansea line.

In Glamorganshire the railway starts from Swansea and runs in a northerly direction for over 15 miles from St. Thomas passenger station to Gwys, there turning westwards and running for 4 miles to Brynamman; a short colliery branch goes north-east from Gwys and the Black Mountain Colliery Branch leaves the main line between Gwys and Brynamman. From Upper Bank, the first station from Swansea, a loop line is made to Glais, 6¼ miles from Swansea. At Ynis-y-Geinon Junction, 12 miles north of Swansea, a union is made with the Neath and Brecon Railway, and at Six Pit Junction, north of the point where the railway is carried under the Great Western line between Swansea Valley Junction and Llansamlet on that railway, a spur line, the joint property of the Great Western and Midland Railways, goes south to join the Great Western line at Swansea Valley Junction. At Brynamman junction lines unite the Midland Railway *ex*-Swansea with the Great Western line from Pantyffynnon. At Swansea a spur line from north of St. Thomas station makes a connection with the Great Western Railway and junction lines make unions with the Swansea

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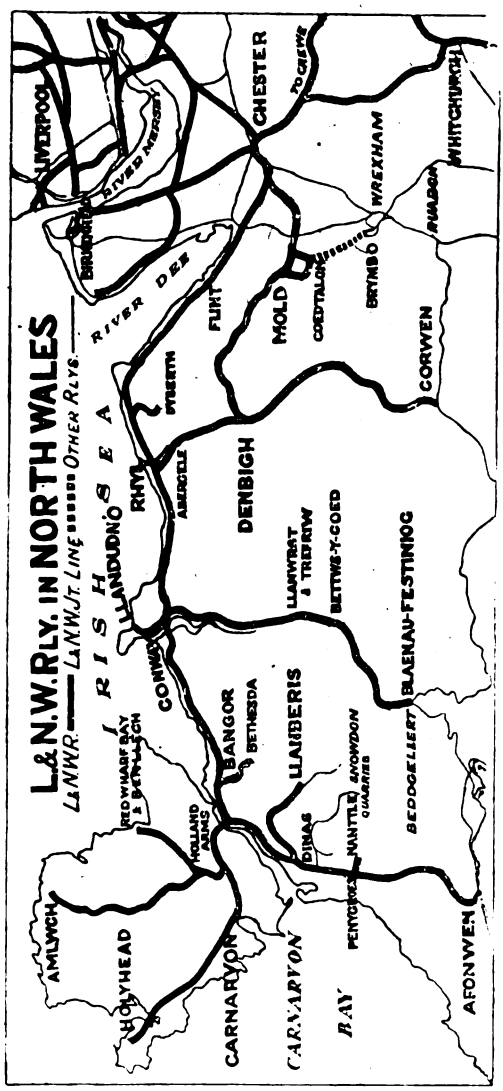
Harbour Trust lines each side of the New Cut. Another spur line from the main line is carried over the New Cut and runs alongside the North Dock. The line for about 12 miles from Upper Bank as far as Ystalyfera runs on the east side, and parallel to, the Swansea Canal, and serves numerous collieries and tin works; the line from Ystalyfera to Brynamman runs through a coal country producing anthracite coal with many works adjacent to the line. The loop line from Upper Bank to Glais has no passenger stations.



The line known as the Swansea Vale was originally owned by a registered company, formed in 1850 to acquire the Swansea Valley Railway, authorised in 1847 for the construction of a railway from Swansea to Cadoxton-juxta-Neath. In 1855 the company was converted into one acting under authority of Parliament, and in 1876 the undertaking was vested in the Midland Railway, the terms being the issue to every holder of shares in the Swansea Vale Company of such an amount of Midland preference stock as would yield an annual dividend equal to the amount of rent to which the holder was entitled under the Lease Act of 1874.

Local services which operate on week-days only between Swansea and Brynamman are supplied by six trains working in each direction, with an augmented service on Saturdays. Between Swansea and Pontardawe, north of which station is the junction with the Neath and Brecon Railway, there are also a couple of services given by trains that run to and from Brecon.

The railway from Three Cocks to Hay and Hereford was incorporated as the Hereford, Hay and Brecon Railway, and was leased to the Midland in 1874, the latter being empowered to absorb and consolidate the stock of the original company, which was to be dissolved on completion of the exchange. The line from Hereford to Three Cocks Junction is 26¾ miles in length, and east of Hay station a junction is made with the Golden Valley line of the Great Western Railway. West of Three Cocks Junction the working is over the metals of the Cambrian Company for 7½ miles to Talyllyn Junction, and from there for 4¼ miles over the Brecon and Merthyr Tydfil Junction Railway to Brecon. From Brecon Joint station the Neath and Brecon line is the means of connecting the Hereford, Hay and Brecon line and the Swansea lines, the stretch of Neath and Brecon railway worked over from Brecon to Ynis-y-Geinon Junction being 2 3¾ miles. By an agreement approved in 1877 the Neath and Brecon line from Brecon to Ynis-y-Geinon Junction *viâ* Colbren and Ystradgynlais was worked by the Midland for five years from July, 1877, at 70 per cent. of the gross receipts. This agreement was prolonged for one year from 1882, extended for five years from 1883 and further prolonged for five years from 1888. The arrangement left but 11¼ miles of the system to be worked by the Neath and Brecon Company. The Midland agreement for working the line leading to Swansea *viâ* Colbren and Ystradgynlais expired in June, 1888. The old working arrangement was continued for

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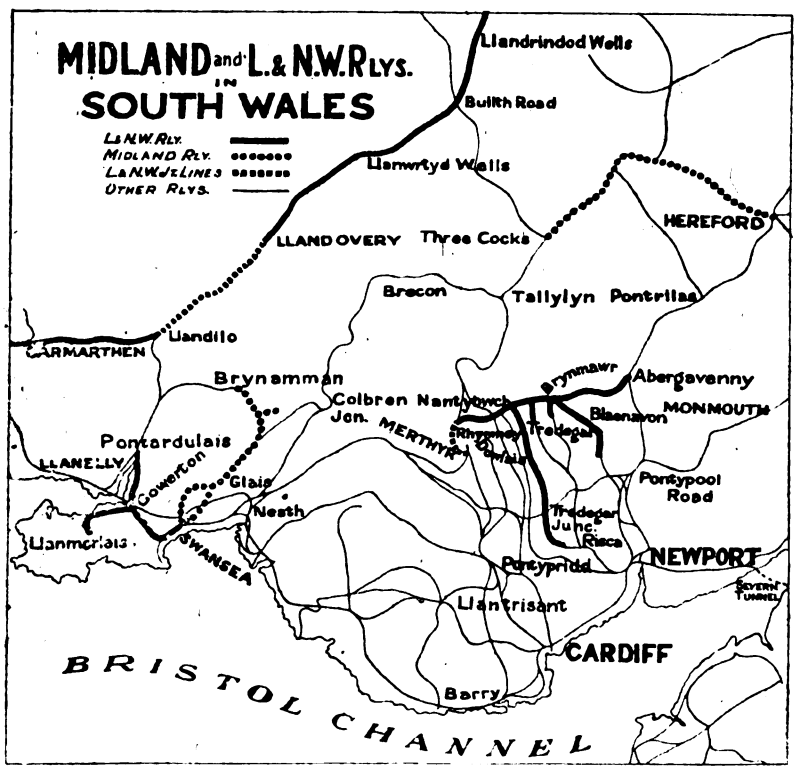
another year and the Midland then removed its plant and materials from the line, and diverted its traffic by the Great Western route, but afterwards decided to resume sending traffic by the Neath and Brecon Railway and to exercise its running powers. Over the Neath and Brecon line the passenger service is provided by the Midland Railway between Brecon and Ystradgynlais *viâ* Colbren by means of Midland trains between Swansea (St. Thomas) and Brecon and beyond, Neath and Brecon Company's trains working only over the Colbren Junction–Neath line.

venient connections with the Brecon and Merthyr Tydfil Junction Railway's trains for Dowlais and Newport, and at Talyllyn and Three Cocks Junction with Cambrian trains for all parts of that Company's system; at Hereford the Midland and Great Western trains use the same station. By the first morning train from Swansea through carriages are sent through to Birmingham and an afternoon train takes through carriages from Hereford to Birmingham, while in the reverse direction through carriages work to Swansea by a morning train from Birmingham, and by an afternoon train from Wor-



Between Swansea and Hereford *viâ* the Neath and Brecon Railway and Three Cocks Junction three services are given on weekdays in each direction, and on Saturdays an extra train runs from Brecon to Swansea in the early afternoon, returning in the evening. The Neath and Brecon Company's trains from Neath are timed to arrive at Colbren Junction in conjunction with the arrival there of the Midland trains from Swansea to Brecon, and those for Neath leave Colbren Junction after the arrival of the Midland trains from Brecon to Swansea. The trains between Swansea and Brecon make concester. The times booked for the journey from Swansea to a few of the large towns on the Midland Railway *viâ* Brecon and Hereford are :—

To Birmingham	7	hours	20	min.
,, Derby ..	9	,,	—	
,, Nottingham	9	,,	15	,,
,, Manchester..	10	,,	50	,,
,, Sheffield ..	10	,,	—	
,, Leeds ..	11	,,	15	,,
,, Bradford ..	11	,,	35	,,

In South Wales the London and North Western Railway possesses a number of railways isolated from the main line, and one

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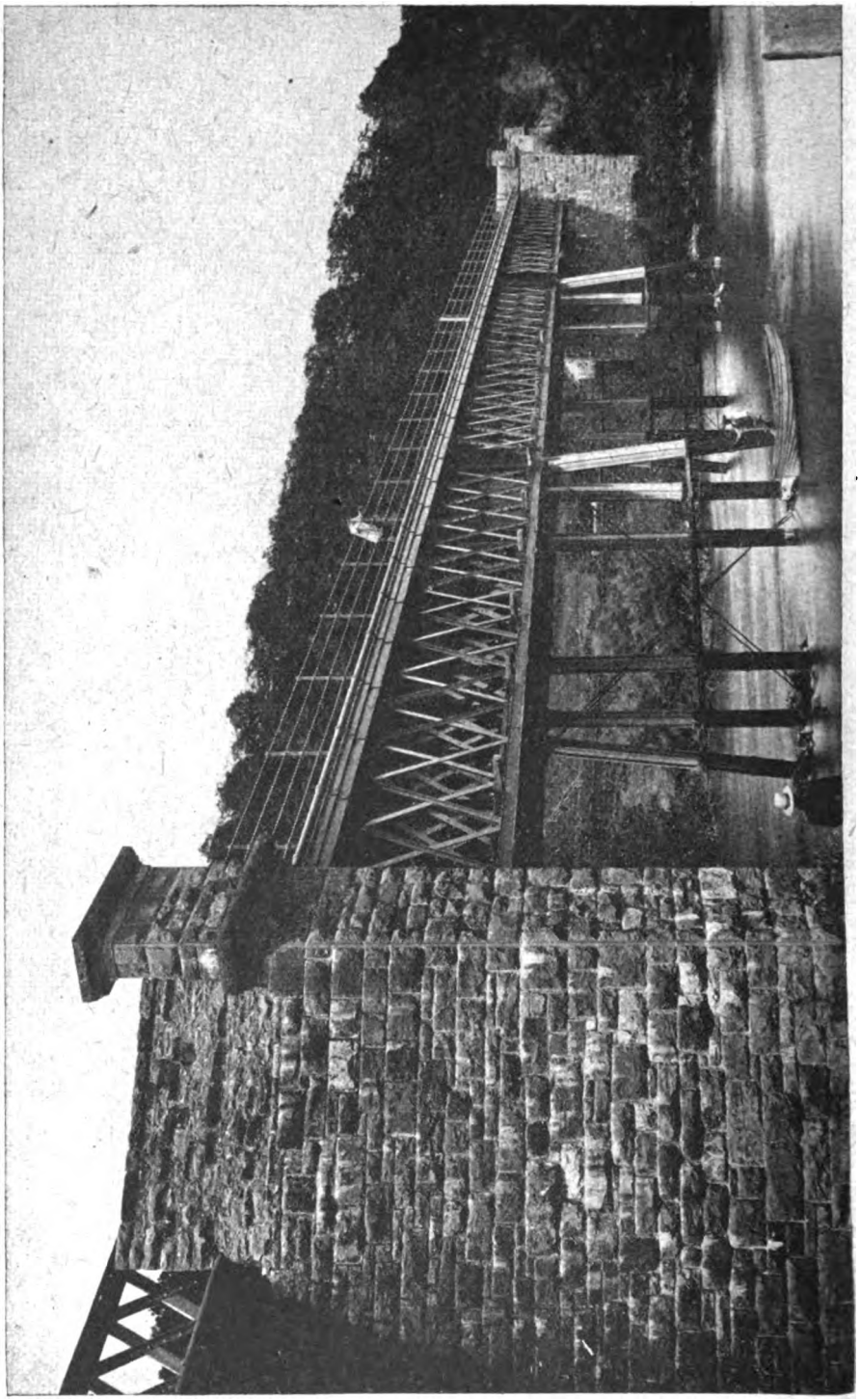

MIDLAND RAILWAY.
Viaduct over the River Wye, Whitney.

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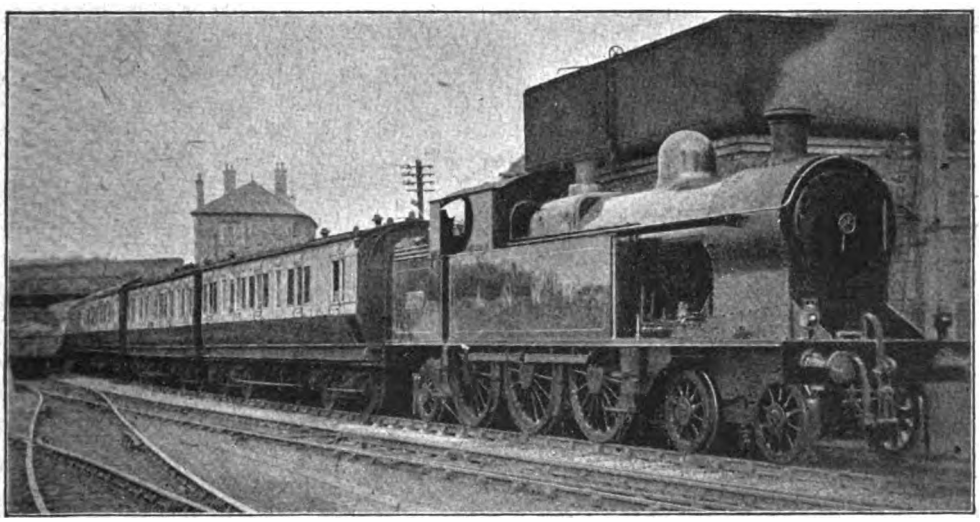
which runs through Central Wales to join at Craven Arms in Shropshire the Great Western and London and North Western Joint Shrewsbury and Hereford line, and is joint owner with the Great Western of the track which connects its line through Central Wales with its Carmarthen and Llandilo line ; it is also joint owner with the Brecon and Merthyr Tydfil Junction Railway of the short railway from Dowlais to Merthyr Tydfil.

The Merthyr, Tredegar and Abergavenny Railway, running transversely from east to west, commences at Abergavenny Junction, where it joins the Great Western Railway running from Hereford to Newport at a point about a mile north of Abergavenny

Beaufort Junction to Ebbw Vale, a great steel and ironworks centre, and on from Beaufort to Nantybwch and Dowlais, where it turns north-west to meet at Morlais Junction the Brecon and Merthyr Tydfil Junction Railway's fork line from Pontsticill, the two lines merging at Morlais Junction into the Brecon and Merthyr Tydfil Junction and London and North Western Joint Dowlais and Merthyr Tydfil line. The line from the east side of Dowlais to Morlais Junction goes under lines of the Brecon and Merthyr Tydfil Junction Railway five times, and makes junctions with that railway by spur lines near Dowlais Top station, Brecon and Merthyr Tydfil Junction Railway, and



Photo] [*G. M. Perkins.*

LONDON AND NORTH WESTERN RAILWAY.

Central Wales express from Swansea in Knighton station—the gate of Central Wales.

station, Great Western Railway, was amalgamated with the London and North Western in 1866. It follows a winding course west to Brynmawr, where it falls a little way south, about a mile, to Nantyglo, where it joins a line of the Great Western Railway running south to Newport. At Brynmawr the Brynmawr and Blaenavon Railway, absorbed by the London and North Western in 1869, runs for a short distance in an easterly direction, turning sharply south-east to Blaenavon and thence due south to Aberyschan and Talywain. From Brynmawr, continuing westwards, the Merthyr, Tredegar and Abergavenny Railway goes through Beaufort with a branch 1½ miles long from

at a point about half-a-mile beyond the High Street station. Southwards, from Nantybwch, the Sirhowy Railway, acquired by the London and North Western in 1876, runs *viâ* Blackwood to Nine Mile Point, joining there the Great Western branch line from Risca. Hereford, on the Shrewsbury and Hereford (Great Western and London and North Western Joint) line, to reach which it is necessary to traverse the Great Western Railway from Abergavenny Junction, is the nearest point on the English lines of the London and North Western Railway to the Merthyr, Tredegar and Abergavenny line and its branches. Separating, as it does roughly, industrial from pastoral and

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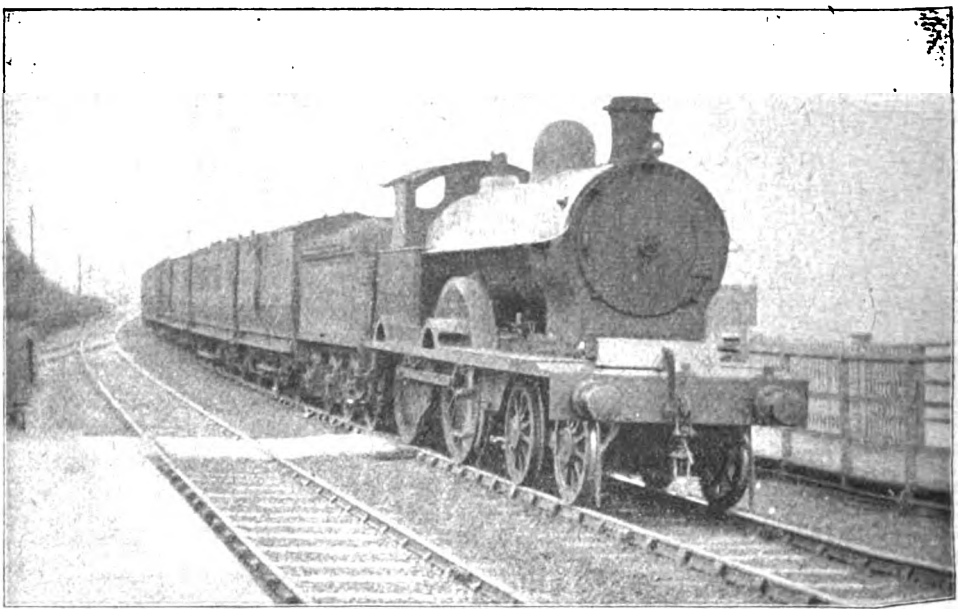
agricultural South Wales, the Merthyr, Tredegar and Abergavenny line affords a strong contrast of country north and south of the railway. To the south of the line is the homeland of coal mines, iron and steel works, and blast furnaces never at rest, whose red fire glow at night gives to a journey by night a weird and unreal character; a fascinating yet sometimes repulsive experience. By day the country, with its chimney stacks, colliery plant and fencings, slag banks and generally scorched and blackened appearance, is anything but inviting. North of the line a few lime works and quarries are dotted about close to the railway, but beyond is the un-



Photo] [*J. W. Idle.*

LONDON AND NORTH WESTERN RAILWAY.

4-4-0 locomotive, No. 643, *Sirocco*, in Old Colwyn station.

touched open country, stretching beyond the river Usk, with Sugar Loaf Mountain marking the east end of the Vale of Crickhowell, and further to the north the Black Forest and Black Mountains.

The Merthyr, Tredegar and Abergavenny line and its branches are closed for passenger traffic on Sundays, except for one early morning train from Abergavenny to Brynmawr, Nantybwch and Tredegar, providing a connection with Saturday night trains from Liverpool and Manchester.

On week-days the service is fairly frequent, nine trains being booked for the journey from Abergavenny to Merthyr Tydfil, plus one in the morning from Abergavenny to Tredegar *viâ* Nantybwch. In the other direction seven trains make the throughout journey and others work over sections of the line. From Brynmawr to Nantyglo trains run daily, and trains run from Nantyglo in connection on the Great Western Railway to Aberbeeg, with connections thence in all cases to Newport. On the Aberyschan and Talywain branch the train service is somewhat less frequent and rail motor cars are largely employed. Eight trains work from Brynmawr to Aberyschan and Talywain, with Great Western services connecting on to Pontypool Crane Street and thence to Newport.

From Nantybwch to Nine Mile Point the Sirhowy branch is provided with fourteen trains from Nantybwch to Tredegar and six from Tredegar to Nine Mile Point with Great Western connections thence to Risca and Newport. On Saturdays an early afternoon train used to leave Tredegar for Cardiff, Rhymney Railway, *viâ* Pontllanfraith and Ystrad Mynach, returning late at night, but this is one of the convenient services which has had to be withdrawn on account of the war.

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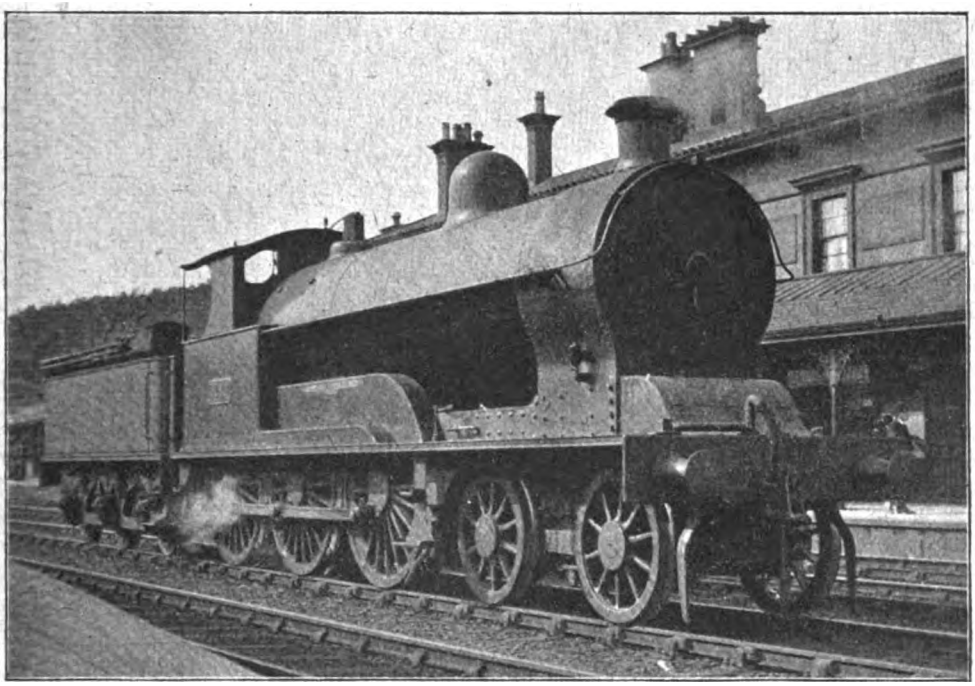
By way of Sirhowy Junction, Nantybwch and Abergavenny Junction a good route is opened from the Rhymney Railway to the Midlands, North of England and Scotland.

The Brecon and Merthyr Tydfil Junction and London and North Western Railway's Joint line, which links up the Brecon and Merthyr Tydfil Junction Railway and the London and North Western Company's Merthyr, Tredegar and Abergavenny Railway at Morlais Junction, takes a semi-circular route to Merthyr Tydfil, where it makes junctions with the Great Western and Taff Vale Railways. The Brecon and Merthyr Tydfil Junction Company maintains four passenger services by this route from Brecon to Merthyr Tydfil on week-days and *vice versa*.

The London and North Western Company's short railways from Swansea and from Carmarthen were originally parts of the old Llanelly Dock and Railway. The line from Swansea is but 12½ miles long northwards to Pontardulais, with a short branch from Llanmorlais joining it at Gowerton. The line from Carmarthen east to Llandilo is 14 miles in length.

The Carmarthen Junction and Central Wales Railway was amalgamated with the London and North Western in 1891, and by means of this railway and the Vale of Towy Great Western and London and North Western Joint Railway the London and North Western Railway has through communication from and to Carmarthen and the main line *viâ* Craven Arms on the Shrewsbury and Hereford Joint (Great Western and London and North Western) line and Shrewsbury. The running powers possessed by the London and North Western Railway over the Great Western Llanelly–Llandilo line between Pontardulais and Llandilo ensures through communication between Swansea and the main line by the same route.

In 1891 the Central Wales line was vested in the London and North Western Railway. From Craven Arms the line flows in a south-westerly direction through Knighton, where it enters Wales, and Builth to Llandovery. The line from Knighton to Llandovery covers 46¼ miles through country which for the purity of its exhilarating air is unsurpassed. Through the whole district the



Photo] [*D. B. Bradshaw.*

LONDON AND NORTH WESTERN RAILWAY.

4-6-0 locomotive, No. 1781, *Lightning*, at Bangor station.

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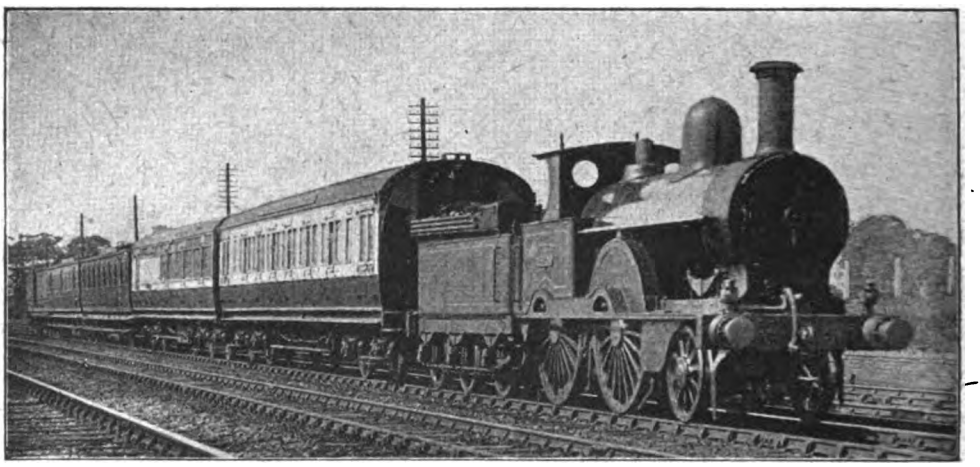
scenery, with its grass covered hills and well watered valleys, is altogether pleasing, and what adds to its attractiveness in the eyes of the town dweller is the provision of modern and well-equipped hotels. There is first class sport for the golfer and the angler. The Central Wales line in Llandrindod Wells serves the best known of the Welsh Spas. It is claimed for Llandrindod that the rich mineral deposits in the neighbouring mountains give the springs qualities equal to those found in any of the Continental waters. The waters of Llandrindod include saline, sulphur, chalybeate, lithia saline and magnesia, and the town itself is everything that could be desired as a place to sojourn in whether as an invalid having recourse to a "cure" or an active holiday-maker. Large and modern hotels, private hotels, pensions and private accommodation abound, and first class fishing and golf, as well as minor sports, enter largely into the life of the town. Builth has for long been a fashionable spa and riverside resort, and Garth, which is little known at present, is likely to grow owing to the recent development of a magnesium spring there. Further south is Llangammarch Wells, situated at the junction of the rivers Cammach and Irfon. This spa with a particularly mild climate is, so far as the Wells are concerned, comparatively a new place. Besides sulphur it possesses a spring which contains as a constituent part barium chloride, which, excepting the Kreuznach Springs, does not enter into the composition of any other known mineral water. Llanwrtyd Wells is a spa equipped in all respects in an up-to-date manner and enjoys a considerable reputation. This picturesque little place of sulphur springs stands at the entrance to the Irfon Valley, 700 ft. above sea level and, like the neighbouring Wells, is happy in the possession of a very equable temperature.

Four miles beyond Llanwrtyd Wells the railway passes from Brecknock to Carmarthenshire, and fifteen miles below Llanwrtyd Wells arrives at Llandovery, an agreeable town in the upper valley of the river Towy, with objects of antiquarian interest.

At one time owned by an independent company, the Vale of Towy Railway, from Llandovery to Llandilo, was vested in 1884 jointly in the Great Western and the London and North Western Railways.

At Builth the Central Wales line makes a junction with the Cambrian Company's north and south line through mid-Wales from Moat Lane Junction to Brecon, and the Carmarthen and Llandilo line joins the Great Western Railway at both ends, the union at Carmarthen being made at Abergwili Junction east of the Town station, the London and North Western Railway using the Great Western line from the junction to run into the Town proper. The Swansea railway running from the Great Western line at Pontardulais makes junctions at Swansea with the Great Western Railway and the



Photo] [*C. Laundy.*

LONDON AND NORTH WESTERN RAILWAY.
Aberystwyth and Welshpool portion of up express. Two Cambrian coaches at rear.
Locomotive No. 477, *Caractacus.*

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railways of the Swansea Harbour Trust, and from between Swansea Bay station and Swansea Victoria station a docks line runs alongside the South Dock. Swansea is the oldest of the South Wales ports and as far back as the eighteenth century it had an import trade in ores sent to the coal areas for smelting, and it was the pioneer of the export coal trade. The Swansea Harbour Trust was founded as far back as 1790, when the total tonnage of vessels using Swansea was 74,000. In 1911 the coal shipped at Swansea was 3,777,113 tons, and in the same year the imports amounted to 1,053,529 tons, and the general exports other than coal 1,277,824 tons, of which tinplates accounted for 432,798 tons, and galvanised iron 69,098 tons. The largest patent fuel works in the country is on the Dock property as well as several others. These exported in 1911 a total of 682,358 tons. The coal shipped at Swansea is mainly anthracite from the Vale of Neath and also from the Llanelly and Amman Valleys and the Gwendreath Valley.

The London and North Western passenger services over the Central Wales, Vale of Towy, Carmarthen and Swansea lines are allied, and trains from Craven Arms in all cases give connections below Llandilo to both Swansea and Carmarthen. The line between Pontardulais and Swansea is also provided with a number of trains above the number working on the Central Wales line, but this is not the case on the Carmarthen line. The passenger trains booked on week-days between the terminal stations on the Central Wales, the Vale of Towy, and the Swansea and Carmarthen lines in the down direction are shown in the following table :—

To	From Craven Arms.	Llandovery.	Llandilo.	Pontardulais.
Llandovery	6*	—	—	—
Llandilo	6	7	—	—
Carmarthen	6	6	6†	—
Swansea	6	7	6†	16†‡

* Also one from Craven Arms terminating at Builth Road.
† One extra on Saturdays only.
‡ Two market trains, third class only, extra on Saturdays from Gowerton.

Five trains work each way on the Llanmorlais Branch to and from Gowerton, the service being performed by one class cars.

Most of the trains between Pontardulais and Swansea call at all intermediate stations *en route*, but there are some that work between Pontardulais and Mumbles Road or Swansea Bay without an intermediate stop.

The Central Wales route provides direct transit between Swansea and the North, with the convenience of through carriages from Swansea *viâ* Crewe serving many of the large towns of Lancashire and Yorkshire. The 7.50 a.m., 9.45 a.m., 12.40 p.m., and 3 p.m. trains from Swansea carry through carriages for Manchester *viâ* Crewe ; the 9.45 a.m. and the 3 p.m. trains have through carriages from Swansea to Liverpool and the 7 p.m. train has a through carriage attached from Swansea for York *viâ* Crewe, Huddersfield and Leeds. The communications with London are not overlooked, although the route *viâ* Crewe is a roundabout one, and the 7.50 a.m. and the 12.40 p.m. trains from Swansea both haul through carriages destined for London. Through carriages work into Swansea to balance the outgoing vehicles from London, Liverpool, Manchester and York. The journey times between Swansea and some of the important London and North Western Railway stations are approximately :—

London (Euston)	7 hours	40 min.
Birmingham	7 ,,	—
Stafford	5 ,,	10 ,,
Leeds	7 ,,	40 ,,
Liverpool (Lime Street) ..	6 ,,	20 ,,
Manchester (London Road)	6 ,,	—
Crewe	5 ,,	10 ,,

On the Carmarthen line the train service from Carmarthen to Llandilo synchronises with trains giving services northwards, and the journey times between Carmarthen and large towns reached by the London and North Western Railway are identical with the Swansea times ; through carriages work from Carmarthen to Shrewsbury, Crewe and Manchester and back.

In North Wales the London and North Western has a principal line running from Chester along the shores of Flint and Denbigh and North Carnarvon as far as the west end of the Menai Straits, where it falls south to join the Cambrian line at Afonwen on the

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south Carnarvonshire coast. This line is branched alongside the Menai Straits and a track is carried over the sea into Anglesey by the Britannia Bridge, a tubular girder structure consisting of two spans each of 460 ft. and two spans each of 230 ft. In Anglesey the railway keeps to the western side of the island all the way, again crossing a narrow channel of the sea to arrive at Holyhead in Holy Island. A forked branch runs to the north and east side of the Isle of Anglesey, and from the railway alongside the North Wales coast two branch lines are laid down southwards, one of which meets at Corwen the Great Western line from Ruabon through the Vale of Llangollen; a number of other short branches are constructed from the North Wales coast line. To the Ruthin and Corwen branch at Denbigh is joined a line which starts from the main Chester and Holyhead line just inside the Welsh border and makes a winding track first south-west, then west, turning north-west to run parallel to the North Wales coast line for some way before bending west to Denbigh. The main part of Flintshire thus has its east, north and west boundaries marked by lines of the London and North Western Railway.

The North Wales section of the London and North Western Railway leaves the main line (London and Carlisle) at Crewe and passing Chester enters Wales west of Saltney station. It originally consisted of a number of separate undertakings. The Chester and Holyhead Railway was absorbed by the London and North Western in 1858, and the Carnarvonshire and the Carnarvon and Llanberis undertakings were both amalgamated with the London and North Western in 1870; the Denbigh, Ruthin and Corwen Railway was absorbed in 1879.

The line from Chester to Holyhead is traversed by the London and Holyhead Irish Boat Expresses in connection with the sailings of steamers to Kingstown, Dublin and Greenore, but none of the boat trains call at stations intermediate between Chester and the port of Holyhead. The service over the line is frequent and many of the local services are provided by express trains which do not call at all stations *en route*. It is an odd coincidence that the only Welsh train services affording fast non-stop runs are supplied by the trains of the two largest English railways and are along the coast, viz., by the London and North Western trains along the north coast and by the Great Western trains along the south coast. From Chester to Holyhead ten local services are tabled with eight connections to Carnarvon and five to Afonwen. Of these four may be classed as "express." Other trains leave Chester to Rhyl, Llandudno and Bangor, and from Llandudno Junction to Bangor, Bangor to Carnarvon and Afonwen, Bangor to Anglesey, and Colwyn Bay to Llandudno. The passenger trains working over the lines Chester – Bangor – Holyhead – Afonwen on week-days, exclusive of the boat trains and trains which run on certain days of the week only total 56 running westwards and 48 running eastwards, and an analysis of the passenger train working on various sections of the line is given in the appended table:—

Section.	Distance, miles.	Trains westwards.	Trains eastwards.
Chester–Holyhead	84½	7	7
,, Rhyl	30	6	5
,, Llandudno	47¾	6	7
,, Bangor	59¾	6	2
Colwyn Bay–Llandudno	7½	8	10
Llandudno–Bangor	12	7	8
Bangor–Isle of Anglesey	24¼*	4†	3‡
,, Carnarvon	8¾	7	7
,, Afonwen	27½	7	6
Carnarvon–Afonwen	18¾	1	1

* Bangor to Holyhead.
† Two to Holyhead, one each to Amlwch and Red Wharf Bay.
‡ One each from Holyhead, Amlwch and Red Wharf Bay.

In this table the less does not include the greater, *i.e.*, the number of trains given between Chester and Rhyl or Chester and Bangor does not include trains working from Chester to Holyhead, although such a train would pass through the sections Chester and Rhyl and Chester and Bangor. Other trains serve the line on short sections not shown in the table. Frequent connections are maintained by the London and North Western Railway from London and the principal main line stations and branches with the North Wales line, and Great Western trains to Chester also make connections,

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while the service from Lancashire towns is frequent. Through carriages work on many trains from London and Birmingham to Rhyl, Llandudno and beyond, and the number of through vehicles running between Liverpool, and Manchester and North Wales is as follows :—

	Liverpool.	Manchester.
Rhyl } Colwyn Bay }	7	8
Llandudno	4	6
Bangor	4	4
Carnarvon	2	1
Holyhéad	4	3

On the Dyserth branch, 3¼ miles long, nine services, third class only, are given in each direction on week-days between Prestatyn and Dyserth, and on the line Rhyl, St. Asaph and Denbigh, 11¼ miles long, eleven trains work both ways on week-days. There is no service on either of these branches on Sundays. Llandudno Junction is a double junction, with the short line going north to Llandudno and the branch running south to Blaenau Festiniog. 37 trains run from Llandudno Junction to Llandudno each week-day and 34 in the other direction, the Sunday trains numbering 3 each way. The line to Blaenau Festiniog is served by seven trains to and from Blaenau Festiniog, 27½ miles from Llandudno Junction, with two additional working between Llandudno Junction and Bettws-y-Coed, 12½ miles, on week-days. On Sundays a train leaves Llandudno Junction in the early morning for Blaenau Festiniog, working back in the evening. The Bethesda branch, 5 miles long, is provided with a one class service on week-days, eleven trains running to and fro between Bangor and Bethesda. On the Carnarvon and Llanberis Railway, 9 miles in length, seven trains run in both directions on week-days only. From Penygroes a line a little over a mile long is laid down to Nantle, and nine services are provided, third class only, on week-days in each direction. This short branch gives access to the Nantle Slate Quarries, and a tram-road runs from Nantle station to the quarries.

In the Isle of Anglesey the branch to Amlwch is supplied with seven trains each way between Gaerwen and Amlwch, and the new branch, constructed from the Amlwch branch line, from Holland Arms to Red Wharf Bay has six services, third class only, in each direction. The Red Wharf Bay branch was authorised in 1900 and opened for traffic ten years later. Both these branches are without services on Sundays.

To complete the London and North Western's North Wales railways it is necessary to return east to Chester. Four miles west of Chester a line leaves the North Wales main line and goes south-west a little way, and turning north-west runs beyond Mold for about ten miles parallel with the main coast line and bending west arrives at Denbigh, where it is united to the branch line from Rhyl. From Denbigh the line works south by an irregular course for over 18 miles to Corwen, there effecting a junction with the Great Western Railway. The train service on these lines is maintained by nine trains from Chester to Denbigh, with two additional from Chester to Mold and four from Mold to Denbigh. From Denbigh to Corwen five trains are booked to run, with four extra from Denbigh to Ruthin. The service in the opposite direction is on similar lines, and no service is operative on the line on Sundays. From Mold a branch line runs south through the coal-fields to Brymbo, a distance of 8½ miles. This line, from Coed Talon, a station 4½ miles south of Mold, to Brymbo, is a single line jointly owned with the Great Western Railway, and known as the Wrexham and Minera Extension Line. Four services, third class only, apply between Mold and Brymbo on week-days only.

In North Wales the London and North Western Railway serves a district of the highest qualities of attraction to tourists. Along the north coast of Wales are flourishing, go-ahead sea-side towns that year by year draw thousands of visitors from Lancashire and Yorkshire, the Midlands and districts more distant. Rhyl, Colwyn Bay and Llandudno are popular sea-side resorts known all over England, each with a wealth of natural attractions and organised amusements. Prestatyn, Penmaenmawr and Llanfairfechan face Beaumaris Bay, of which Borrow wrote that on viewing it he exclaimed, "What a bay! For beauty it is superior to the far-famed one of Naples." Conway, Bangor and Carnarvon are convenient tourist centres, as well as places of considerable charm and historic interest in themselves. All these sea-side places in North Wales give good bathing and boating, and in the summer steamer trips are run from Rhyl, Llandudno, Colwyn Bay and Bangor. From Carnarvon the Snowdon district is easily accessible. A short rail journey to Llanberis lands the tourist in the midst of the best mountain scenery, and from Llanberis the ascent of Snowdon can be made by foot or tram. From Dinas, the next station

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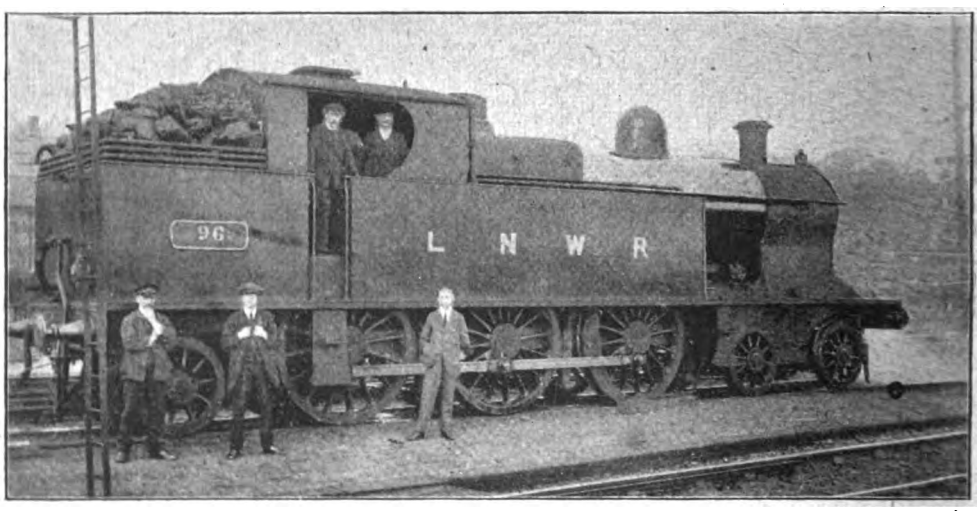
west of Carnarvon, a narrow gauge railway runs inland ten miles to a station named Snowdon, three miles from the summit of the mountain, known as the North Wales Narrow Gauge Railway. This line was illustrated and described in the RAILWAY MAGAZINE in July, 1917.

At Bangor a suspension bridge unites the mainland with the Isle of Anglesey, and a short walk on the other side of the bridge brings the traveller to Beaumaris. Trefiw Spa, near Llanrwst and Trefiw station on the Blaenau Festiniog branch, will appeal to many who like an inland resort. The chalybeate (sulphur) mineral waters are the richest sulphur iron waters known. The spa can be reached by steamer down the river or by motor omnibus from Conway. The station south of Llanrwst and Trefiw is Bettws-y-Coed, a "show" place of Wales, whence a motor omnibus plies to Capel Currig, the journey being through most romantic scenery. In the Isle of Anglesey a number of sea-side villages invite visitors desiring a quiet holiday in pretty country, with the benefit of the most invigorating air, to return time after time to the peaceful island. Amlwch is a quaint old sea-port town on the north Anglesey coast, and Bull Bay and Cemaes Bay are adjacent; Rhosneigr is a favourite resort on the south side of Anglesey. The new branch line to Red Wharf Bay has made accessible the sea-side villages of Pentraeth, Red Wharf Bay, Benllech and Moelfre on the east side of Anglesey. At Holyhead on Holy Island are the marine headquarters of the London and North Western Railway, and here the Company has established an hotel which is of great convenience to passengers to Ireland.

[The particulars relating to the train services in this article are taken from the time-tables for January, 1916, as they give a better idea of normal arrangements than those now prevailing under the further restrictions necessitated by the war.]

A WELL-KNOWN WATFORD TANK ENGINE.



This illustration is from a photograph of London and North Western Railway 4-6-2 tank locomotive, No. 96, standing on the "Pilot" track at Bletchley station waiting for its train. The daily working of this engine has already been described in the RAILWAY MAGAZINE, August, 1917, and its dimensions were also given. It recently took a train of 325 tons exclusive of its own weight 40 miles non-stop in 48 minutes—an average speed of 50 miles per hour.

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Locomotive and Train Working in the latter part of the 19th Century.

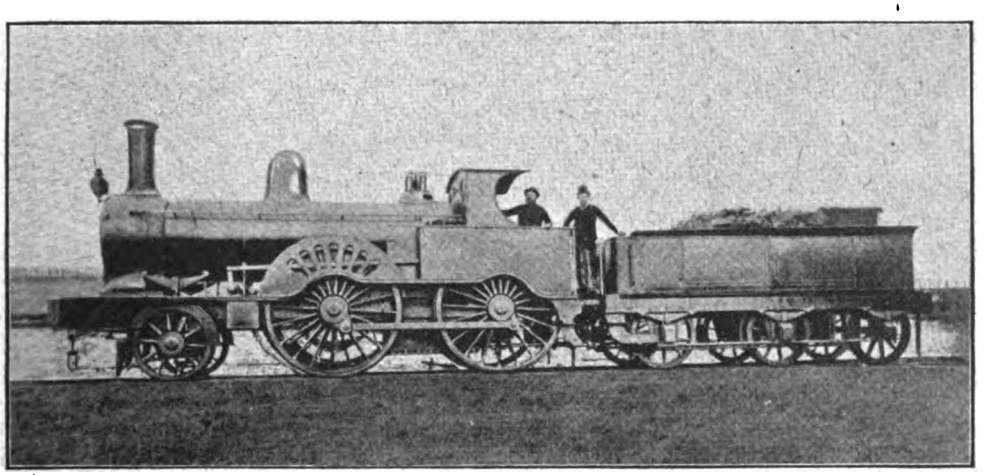
THE LANCASHIRE AND YORKSHIRE RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

BUILT at Crewe in 1873, the largest express engines on the Lancashire and Yorkshire Railway were Nos. 456 to 462 and 731 to 733, a class of ten 6 ft. 7½ in. 2-4-0 coupled engines. These were sister engines of London and North Western engine 1211 *John Ramsbottom*, illustrated in the RAILWAY MAGAZINE for March, 1915, page 222, and had 17 in. by 24 in. cylinders. The only marks which distinguished them from the trip the Preston engines ran through to Leeds *viâ* Burnley.

Altogether the London and North Western Railway constructed 101 engines at Crewe Works for the Lancashire and Yorkshire during the three years 1872-3-4. In addition to the ten express engines just mentioned, there were five four-wheeled shunting tank engines, and no less than 86 goods engines of the well-known DX class.

There is no knowing how long Crewe



Photo] [*Locomotive Publishing Co., Ltd.*

2-4-0 EXPRESS ENGINE, NO. 731.
Wheels, 6 ft. 7½ in. Cylinders, 17 in. by 24 in.
Designed by J. Ramsbottom. Built at Crewe, 1873.

London and North Western engines were the Lancashire and Yorkshire copper topped chimneys, and their green colour in place of the black of the London and North Western Railway. They retained the slotted-out holes in the driving splashers.

These engines were until 1888 generally employed upon the Blackpool and Fleetwood services; for which a number of them were stationed at Lostock Hall (Preston). Most of the turns were to Manchester, but on one Works would have continued to oblige by manufacturing locomotives for another railway, but the private locomotive building firms were unkind enough to obtain an injunction, and stopped the business on the grounds that a railway company had powers only as a carrying and not as a manufacturing trading concern. Since that time whenever one railway has desired to purchase a new engine from another one, the engine in question has been run for a week

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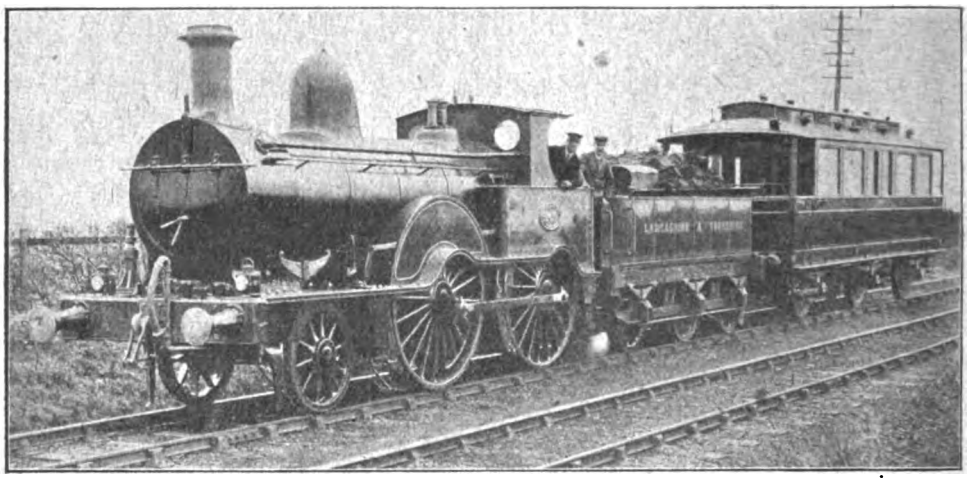

2-4-0 RAMSBOTTOM EXPRESS ENGINE, NO. 460.
Rebuilt at Horwich and used for Engineer's Inspection Coach.

or two on the lines of the constructing company, and then sold as a "second-hand" engine. But there have been only one or two isolated instances of this method of getting behind the law, and these had no connection with the London and North Western and Lancashire and Yorkshire railway companies.

In addition to the engines from the London and North Western there were also eight passenger engines, which had been built for the Great Northern Railway to Mr. P. Stirling's designs. These formed part of an order for 30 engines constructed by Sharp Stewart and Co., of Manchester, in 1875-6, of the well known Great Northern Railway mixed traffic 0-4-2 type with domeless boilers. The eight engines in question were sold by the makers under arrangement with the Great Northern Railway to the Lancashire and Yorkshire in the spring of 1876.* They had the standard dimensions of 5 ft. 7½ in. coupled wheels, 17½ in. by 24 in. cylinders, and 140 lbs. pressure, and although considered by the Great Northern as mixed traffic and express goods engines, they became express passenger engines in the hands of their new owners, for they were undoubtedly the most powerful that had up to that time come into their possession. They were numbered 605, 611, 632, 635, 641, 647, 652, and 659, and were principally quartered at Newton Heath to work the heavier trains to Blackpool and Southport, and they also ran occasionally to Bradford, Leeds and Wakefield. After running for six or seven years with domeless boilers, Mr. Barton Wright cut a hole in the plate forming the middle ring of the barrel, and added a dome to each of the original boilers. They retained the Stirling brass safety valve columns and Great Northern Stirling cabs until Mr. Aspinall rebuilt some of them at Horwich in 1893-4, but they did not last very long after this, for after putting in some time on the Goole road they were broken up in 1900-1.

These were not the only 0-4-2 engines used by the Lancashire and Yorkshire for passenger traffic. There was also a fairly numerous class of extremely antiquated four-coupled goods engines with 4 ft. 10 in. wheels and 15 in. by 24 in. cylinders, which had been the original Hawkshaw's goods engines. They were very plain unprepossessing looking machines, painted dead black without any lining out, and had copper topped chimneys and copper domes over the raised fireboxes. The coupling and connecting rods were of the antiquated circular section generally used in the early days. About 20 of them had been built in 1848-9 at Miles Platting, and 12 others by Messrs. Fairbairn at the same period. A few others, which were very similar but had 5 ft. wheels, were rebuilds converted from Bury's four wheeled engines. These and some of the Miles Platting and Fairbairn engines had been rebuilt by Mr. Hirst with his "straightback" boilers and 16 in. cylinders. Before 1876 they had disappeared from the

* Messrs. Sharp Stewart afterwards built 8 more of the class for the Great Northern to take the places of those sold to the Lancashire and Yorkshire.

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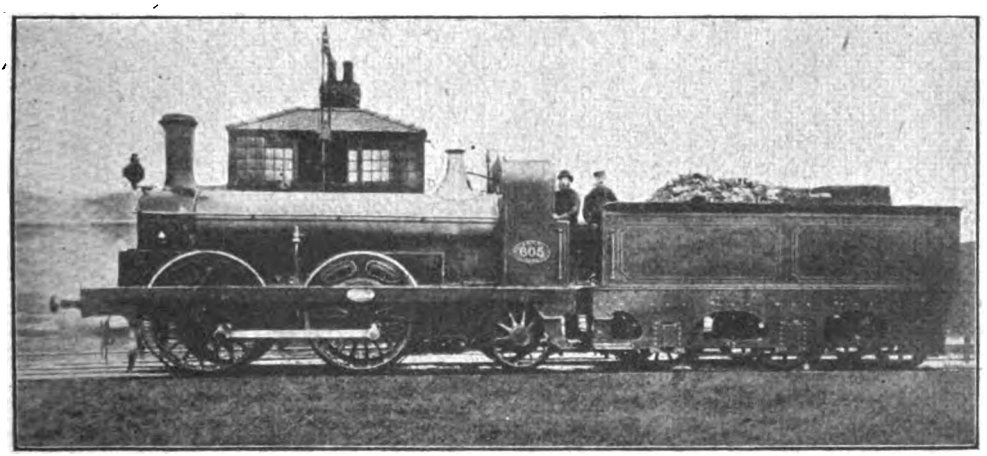
goods service, and like most other Lancashire and Yorkshire goods engines of all classes, as soon as their goods days were ended, they started a new lease of life as passenger engines. They were to be found on slow trains on various parts of the system, but the Bradford to Dewsbury, and Bradford to Huddersfield (*viâ* Mirfield) services saw most of them, whilst a few took the places of the East Lancashire passenger engines and literally rattled their daily round between Leeds (Midland) and Doncaster. Mr. Barton Wright rebuilt an isolated one of them, No. 171, with a domed boiler in 1877, but they all disappeared in the early eighties.

Three other 0-4-2 engines with domeless boilers, Nos. 14, 150 and 151, with 5 ft. wheels and 15 by 24 in. cylinders, were somewhat more modern in appearance and had been built at Miles Platting in 1869–1870. The first of these was always quartered in Lancashire, but Nos. 150 and 151 were at Mirfield on the Bradford, Huddersfield and Holmfirth local services for many years. These were painted the passenger engine green.

Tank engines for passenger traffic existed in considerable numbers on the Lancashire and Yorkshire Railway, and I think it may be truthfully said that this was the first railway to use six wheels coupled tank engines for regular passenger work. The credit for this has occasionally been given to the late Mr. Stroudley, who produced the 0-6-0 "Terriers" for the Brighton Railway in 1872. But the Lancashire and Yorkshire Railway 0-6-0 passenger tank engines dated back to 1856, for Mr. Jenkins used the type exclusively, and between 1856 and 1867 had constructed 22 of them at Miles Platting, all with saddle tanks, 5 ft. coupled wheels, and 15 in. by 24 in. cylinders. Most of them had the special cottage-loaf domes of Mr. Jenkins's baking. The earlier engines of 1856–7, of which there were four, had primitive coupling rods of circular section. By 1876 these had been relegated to station pilot duties and they had mostly disappeared by 1881.

The 1860–1867 engines 269–272, 298–9, 315–319, 358 to 362, and No. 5 were really good machines, and much the handiest local passenger engines that the Lancashire and Yorkshire then possessed. Mr. Barton Wright rebuilt nearly all of them with new boilers and neat cabs, and they did a lot of excellent work on local trains in both counties until Mr. Aspinall gradually broke them up.

Mr. Hirst, who followed Mr. Jenkins, reverted to four coupled wheels for tank engines, and constructed at Miles Platting between 1868 and 1874 about 25 small 2-4-0 engines (No. 2 class) with 5 ft. wheels and cylinders only 15 in. by 20 in. They had domeless boilers, and their one redeeming feature was a cab, which the earlier tank engines had not possessed. But they were miserable little undersized machines and had the hardest work in dealing with trains of over five four-wheeled coaches, for the Lancashire and Yorkshire abounds in heavy



Photo] [*Locomotive Publishing Co., Ltd.*

0-4-2 PASSENGER ENGINE, NO. 605.

Wheels, 5 ft. 7½ in. Cylinders, 17½ in. by 24 in.
Built by Sharp Stewart & Co., 1876, for the Great Northern Railway.

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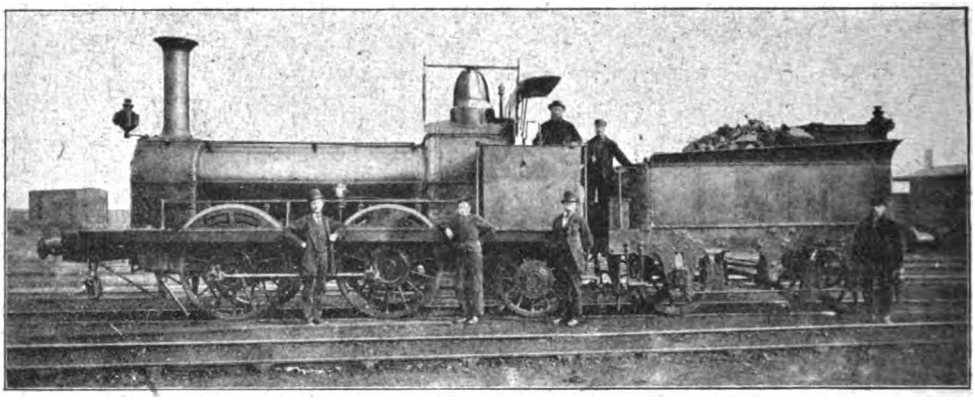

0-4-2 MIXED TRAFFIC ENGINE.
Wheels, 4 ft. 9 in. Cylinders, 15 in. by 24 in.
By Fairbairn, 1849-1850. (Hawkshaw).

gradients far beyond the power of these little engines to tackle. Most of them were in Yorkshire, but three or four were often to be seen on the Blackpool (Central) and Lytham local trains. The saddle tanks of these engines covered the flush fireboxes but extended forward only as far as the back of the smokeboxes.

There still exists at Horwich works a 2-4-0 side tank, one of the last remaining relics of the palæozoic period of the Lancashire and Yorkshire Railway. It is now a crane engine, but was originally one of three Beyer Peacock passenger tank engines built for the East and West Junction Railway, and strayed on to the Lancashire and Yorkshire. These, Nos. 517 to 519, were rather pretty little engines with brass domes and copper capped chimneys, and ran in the Manchester district for ten years, after which they were transferred to Low Moor.

Finally there were a few six coupled passenger tank engines with domeless boilers built by Mr. Hirst in 1873-4 for the severe banks of the Oldham district. These were in reality the standard goods engines of that day with 5 ft. wheels and 17 in. by 24 in. cylinders, in which the tenders had been suppressed and the engines turned out with saddle tanks.

For many years the Lancashire and Yorkshire Railway used 0-6-0 goods engines in large numbers for passenger traffic, especially the Jenkins and Crewe built DX classes, though Mr. Hirst's goods engines were only rarely worked on passenger trains. As mentioned previously in the case of the 0-4-2 engines, whenever a goods engine had apparently reached the sere and yellow leaf stage, it had a surprising habit of taking on a new lease of life and blossoming forth as a first class express engine. In some cases it seemed as if the more sere and yellow it had become, the more it was in demand for express work. "Never say die" was certainly the motto of the old Lancashire and Yorkshire goods engine.

For a considerable period the Manchester-Bradford market train, then one of the most important Lancashire and Yorkshire expresses, was worked by No. 34, a Jenkins 0-6-0 goods engine with 4 ft. 10 in. wheels, and No. 501, a DX Crewe built goods engine, though the Hirst 2-4-0 engines also took an occasional hand, just to show that there was no ill-feeling amongst the passenger engines on the subject.

But it must be admitted that the Lancashire and Yorkshire goods engines did a lot of very good and useful work on the local passenger trains, more especially the Crewe built engines, which eventually in the later "eighties" were used almost exclusively for this kind of work, and rarely worked goods trains at all.

As far as the locomotive working arrangements were concerned there was at Manchester a great gulf fixed between the engines that ran westwards towards Liverpool, Southport, Blackpool, etc., and those that worked the main line trains to Yorkshire, and the busy local traffic to Oldham, Middleton and Stalybridge. The dividing line was at Victoria station, and what I may term the west-bound engines were mostly stabled at Oldfield Road shed (Salford). The East Lancashire engines at one time had a small shed of their own in the Salford district at

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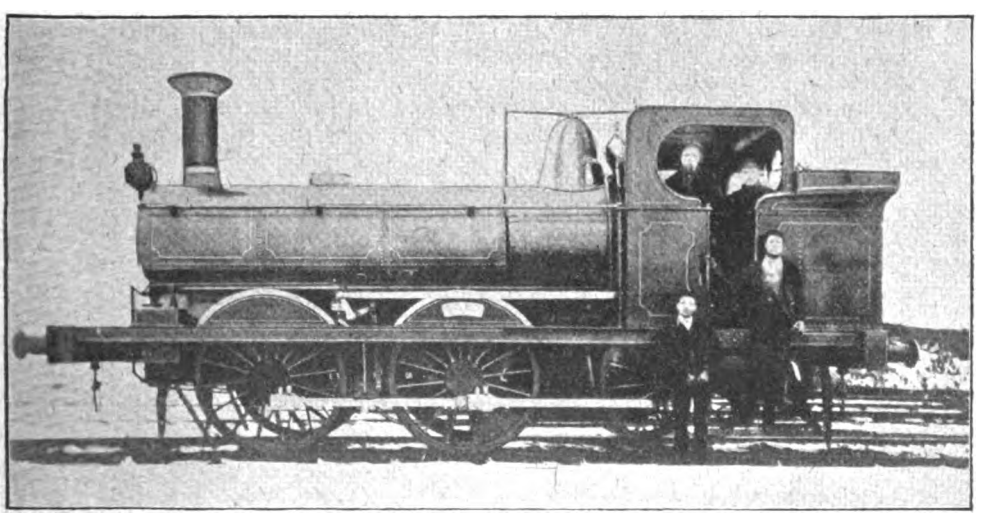
which two passenger engines, 673 *Blacklock* and 680 *Craven*, were stationed. Each of these engines for many years worked two double trips daily from Manchester to Colne and back *viâ* Clifton Junction, Bury and Accrington. Three East Lancashire passenger engines stationed at Bacup, which at one time were 601 *Odin*, 603 *Clio*, and 618 *Titan*, worked regularly to Manchester *viâ* Ramsbottom and Bury. The three engines in question had been built in 1867 at Bury for this service and were originally 2–4–0 "side tanks," but were subsequently converted to tender engines. On the east side, Newton Heath was the headquarters, and engines from this shed mostly confined their attention to the Yorkshire trains and the Oldham, etc., locals. The division between west and east might have been complete, but for the other main line from Rochdale to Southport and Liverpool through Bolton and Wigan, and over this line Wakefield engines worked to Liverpool and *vice versâ*, and I believe that in the summer there was also an occasional passing of locomotive compliments between Southport and Rochdale. But the Southport engines seemed to have enough to tackle in the Manchester service, and the through carriages to Yorkshire were handed over to the Liverpool trains at Bolton.

Further north Low Moor engines ran one train through to Preston, and Lostock Hall (Preston) engines worked a Blackpool train to Leeds with the Crewe-built 6 ft. 7 in. engines. These trains ran direct *viâ* Blackburn and the Stansfield Hall loop at Todmorden. The numerous army of tender and tank engines working the local trains in Yorkshire from Low Moor and Mirfield sheds rarely if ever crossed the county boundary into Lancashire except when they went to Miles Platting for repairs.

Three or four engines at Goole worked a service of trains to the Leeds Lancashire and Yorkshire Central station *viâ* Knottingley, Wakefield and Ardsley, and two or three engines stationed at Doncaster worked *viâ* Knottingley and Methley Junction to Leeds (Midland station). These workings are still in existence.

It was occasionally the practice to bank a more than usually heavy Blackpool train from Manchester (Victoria) to Stoneclough, and to this end one or two of the most ancient and disreputable engines hung round Victoria "waiting for a job." One train that enlisted the services of the banking engine almost daily was the old 2.20 p.m. Blackpool express, which also had the honour of having two London and North Western coaches from Manchester to Glasgow hung on to its tail. The train engine was usually one of the 2–4–0 "Hawkshaw" outside cylinder engines, and the banking engine at the rear was a collection of old scrap iron and other metals that had once been a four-wheeled Fairbairn or Bury of the "carboniferous period." I



Photo] [*Locomotive Publishing Co., Ltd.*

0–6–0 PASSENGER SADDLE TANK ENGINE.
Wheels, 5 ft. Cylinders, 15 in. by 24 in.
Built at Miles Platting. (Jenkins). Period, 1860–1867.

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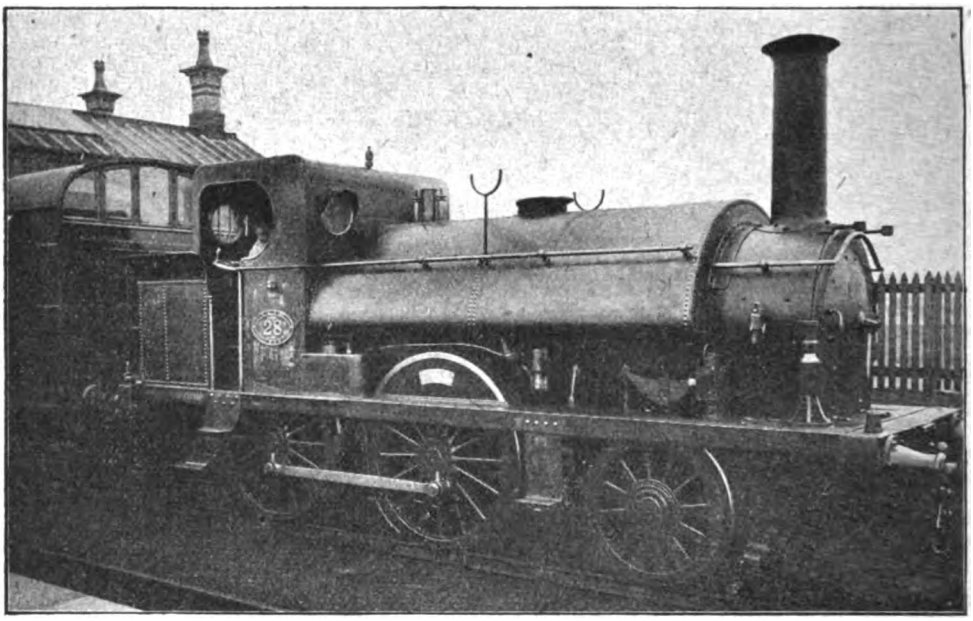

Photo] [*Locomotive Publishing Co., Ltd.*

HIRST'S STANDARD 2-4-0 TANK ENGINE, NO. 28, WITH DOMELESS BOILER.
Wheels, 5 ft. Cylinders, 15 in. by 20 in.
Built at Miles Platting. Period, 1869–1874.

do not know what the weight of the train was, but it probably did not exceed 100 to 120 tons, or the old Hawkshaw would have promptly "downed tools." The following example of banking, "as it ought to be done," is, however, perfectly authentic. The 2.20 started out one day with the Hawkshaw in front and the scrap iron in the rear, the latter intending to take the usual 35 min. or so to Stoneclough and back as far as Salford shed, where it usually put into port to recover after its exertions. After the lapse of about 15 minutes or so the "banker" returned, and on the driver being asked why he had come back so soon, said simply, "It wasn't any good, I couldn't keep up with the train." And the "Hawkshaws" even with a light train could hardly be regarded as greyhounds.

Generally speaking, the Lancashire and Yorkshire trains of about 1877 to 1880, with some exceptions, might from the traveller's point of view have been classified into the three celebrated categories of *Punch's* Bradshaw, viz.:—(1) trains which arrived but did not start, (2) trains which started but did not arrive, and (3) trains which neither started nor arrived. To the would-be searcher after locomotive performances the quest was absolutely hopeless, but if he had the time to spare he was usually well rewarded in the direction of other and possibly unique experiences. Taking a Lancashire express leaving Bradford, a stroll up to the engine before the start probably introduced the traveller to one of the 2–4–0 outside cylinder engines, *e.g.*, 55, 83, 111, 113, etc., the driver of which was engaged in effecting temporary light repairs by trying to fasten a recalcitrant coupling rod cotter with a piece of millband or other handy material. The train having started, a dense cloud of escaping steam conveyed the information that one of the piston rod glands was sadly in need of new packing, and also incidentally helped to thicken the atmosphere of the "bottle neck" tunnel. The engine clanked laboriously up the 1 in 50 bank at an average rate of 8 to 10 miles per hour with a load of some 50 tons, "exclusive of passengers and luggage," as the usual formula has it. At Bowling Junction, just as things seemed about to move, a dead stop for signals occurred. After a six or seven minute wait, and the passengers were becoming restive, it was gathered from information conveyed by the signalman to the driver that the cause "wor that theer owd injun o' Ephraim Sutcliffe's as 'ad 'appen brokken dahn agen, same as it wor allus doin'."

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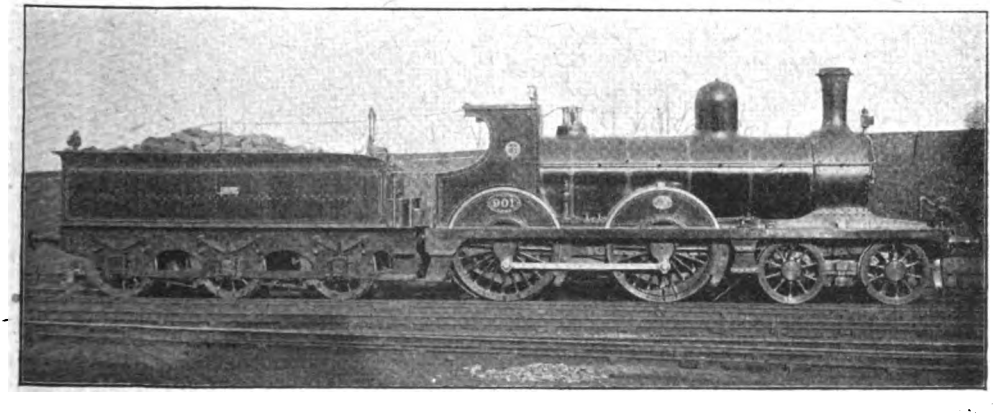
At this point the ringing of a bell in the signal box announced that driver Ephraim had succeeded in getting the steed in question to emerge at the other end of Wibsey Tunnel, and leave the road clear to Low Moor station, where our train pulled up in 22 min. odd seconds from the dead start (distance 3 miles). At Low Moor a wait of seven or eight minutes would occur. Late as the Bradford train was, the Leeds train, which had encountered troubles of its own, was worse, but eventually put in an appearance with four six-wheeled coaches and a Hirst "straightback" 2–4–0 engine in charge, and backed on to the Bradford portion. The load from Low Moor would now be about 90 to 100 tons, and a start was proposed—"Halifax next stop," as the officials announced. This information was quite superfluous and moreover absolutely untrue, for the train just went five yards when the discovery was made that a party of women destined for Cleckheaton and the Spen Valley had stowed themselves into the Manchester train. Result: another minute gone in getting them and their bundles and baskets out on to the platform. A real start was finally made, and the train was running well—say 25 miles per hour—when one of those unfortunate signal stops, that are such a source of annoyance to the speed observer, occurred. This time it was on the Halifax side of Hipperholme; somebody had got a train into Beacon Hill Tunnel and did not seem to know how to get it out again. After a five minute stop at Halifax the mournful procession began to wend its way in the direction of Dryclough Junction. It was proposed D.V. that the next stop should be Sowerby Bridge, but it proved to be Copley Junction to allow a train from Manchester to Wakefield to cross the lines in front. After one such journey to Sowerby Bridge I left the train there with the feelings of the golfer in the story, who had taken 19 for the first hole, 23 for the second, and at the third "began to get into difficulties" and gave up the hole. From Sowerby Bridge I returned on my tracks and made for Halifax by the quickest and most direct route, viz.: by walking over King Cross hill.

In 1876 Mr. Barton Wright took charge of the locomotive department, and from that time a gradual but vast change took place in the Lancashire and Yorkshire Railway locomotives. It used to be said that he scrapped no less than twelve engines at one of the Lancashire sheds within the first month, because they were absolutely worn out.

Mr. Wright's first main line passenger engines were 0–4–4 bogie side tanks, of which the first two were built in 1877 by Kitson and Co., and differed from their successors in having longer side tanks and open splashers. In 1878 the same firm delivered ten more, and Messrs. Dübs and Co. also built ten. These were followed by another series of ten in 1879 from the works of Neilson and Co. All these engines had 5 ft. 8 in. coupled wheels, 3 ft. bogie wheels, 17½ in. by 26 in. cylinders and 140 lbs. pressure. The heating surface was 1,052½ sq. ft. and the weight in working order 49½ tons.

The two first Kitson engines of 1877, Nos.



W. BARTON WRIGHT'S STANDARD EXPRESS ENGINE, NO. 901.
Period, 1880–1886.
Coupled wheels, 6 ft. ½ in. Cylinders, 17½ in. by 26 in. Pressure, 140 lbs. Adams bogies with wheels 3 ft. 7¼ in. diameter.
Built by The Vulcan Foundry Ltd., 1886.

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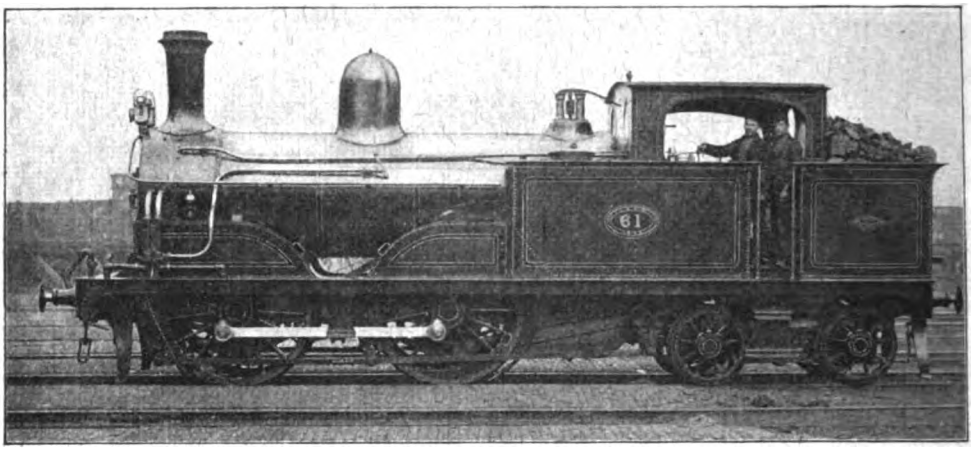

W. BARTON WRIGHT'S STANDARD EXPRESS BOGIE TANK ENGINE, NO. 61.
Fitted with old vacuum brake ejectors.
Several of these engines were fitted with Westinghouse brake.
Wheels, 5 ft. 7½ in. Cylinders, 17½ in. by 26 in.
Built by Dübs & Co., 1878.

111 and 112, spent practically the whole of their existence in the Manchester district, and for many years acted as station pilots at Victoria station. The ten Kitson engines of 1878 were distributed partly on the Manchester and Blackpool service, and Nos. 633, 634 and 642 went to Doncaster to work the local trains to Leeds (Midland). The others were Nos. 41, 43, 49, 604, 613, 628 and 636.

The ten Dübs engines were mostly stationed at Newton Heath, and fitted with the Westinghouse brake for main line express work. They took the places of some of the Hirst 2–4–0 engines on the Manchester and Leeds fast trains, and also ran the Midland Scotch connections between Manchester and Hellifield.

One of them, No. 67, was stabled at Low Moor to run the 9.25 a.m. express from Bradford to Manchester, a train which had been altered to run daily, having increased considerably in weight, and had been fitted throughout with the Westinghouse brake. The other nine Dübs engines at Newton Heath were 55, 56, 60, 61, 71, 74, 79, 83, and 85, and had been given numbers previously borne by the 2–4–0 outside cylinder engines, now relegated to the duplicate list.

The ten similar Neilson engines, 86, 89, 93, 94, 99, 109, 113, 115, 118 and 665, were employed for many years on the Liverpool and Southport line.

Some years afterwards, when the 4–4–0 bogie tender engines began to multiply, the tank engines were transferred from main line to local train work in various districts, and proved such handy engines that 40 more were built in 1885–6 by Sharp Stewart and Co., then of Manchester. One of these, No. 614, named *Victoria*, was at the Liverpool Exhibition of 1886.

The next and probably best known class built by Mr. Wright were the 4–4–0 express engines of 1880 to 1887, with 6 ft. coupled wheels, 17½ in. by 26 in. cylinders, and a heating surface of 1,026 sq. ft. The last sixteen engines of 1887 were built after Mr. Aspinall had taken charge, and differed from their predecessors in having 160 lbs. pressure instead of 140 lbs. and also in the design of the bogies. Mr. Wright's bogie had 3 ft. 7½ in. wheels, and was of the Adams sliding centre type, but Mr. Aspinall introduced the American swing link bogie with 3 ft. wheels and double elliptical bearing springs.

The 110 engines of the class were built as follows :—

Sharp Stewart and Co., 1880 :—629, 630, 643 to 646, 649 and 653.

These, the first engines, had four-wheeled tenders, for the Lancashire and Yorkshire turn-tables in 1880 were not long enough to accommodate bogie engines with six-wheeled tenders. After the lapse of some time the necessary alterations to the turn-tables were made, and the above engines exchanged tenders with the Stirling 0–4–2 Great Northern pattern engines, and

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handed the four-wheeled ones to the latter engines.

The 16 engines of 1881, also built by Sharp Stewart and Co., were mostly fitted with the Westinghouse brake and a few of them were named after directors :—

627 *High Sheriff*	669 *Barnes*
667 *Armytage*	670 *Hare*
668 *Pilkington*	

The others were 656, 658, 661, 664, 671, 672, 674, 675, 678, 681 and 152. Of these 671 was subsequently named *Prince Leopold* and 674 *Duchess of Albany* in honour of a royal visit to Southport.

The above engines took up duties on the most important main line services, but were principally stationed at Newton Heath. 668, 681 and one or two others with the Westinghouse brake were generally on the Scotch trains to Hellifield, and 627 and 667, also with the Westinghouse brake, were always quartered at Low Moor for the 9.25 a.m. from Bradford to Manchester. They returned from Manchester with the evening express at about 5.25 p.m. 671, 672, 674 and 675 were for some years quartered at Southport.

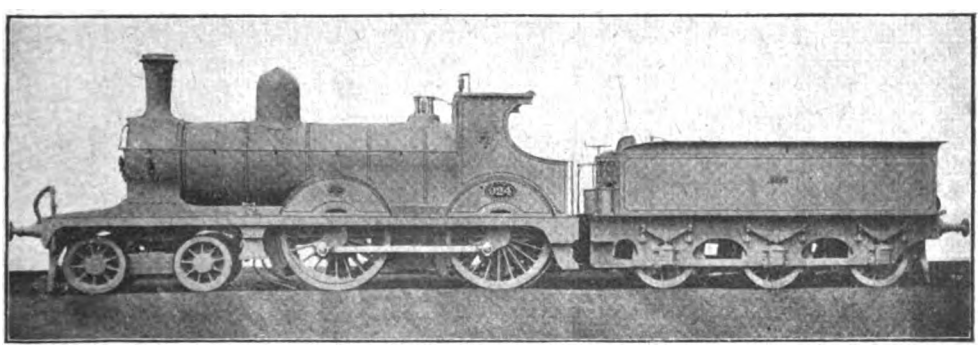
There followed in 1883 Nos. 813 to 832 from Neilson and Co., and in 1884 Nos. 833 to 842, built by the same firm. The last ten had Joy's valve gear and were the first Lancashire and Yorkshire engines to be so fitted.

1885 saw the appearance of 20 more built by Kitson and Co., Nos. 863 to 882. Of these 873 was named *Edward Green*, and shortly after their appearance 865 was named *Prince of Wales* and 866 *Princess of Wales* in honour of a royal visit to Leeds.

Engines 886 to 905 were built in 1885–6 by The Vulcan Foundry Ltd., and finally the same firm constructed in 1887 the last sixteen with Mr. Aspinall's modifications. These were 209, 219, 271, 298, 300, 694, 698 and 919 to 927, of which No. 219 was shown at the Manchester Exhibition of 1887.

I have few preserved records of the work of these engines. In their day the Lancashire and Yorkshire Railway, though a vastly improved line, had not many runs at really express speeds. I believe I have at one time or another travelled behind every one of these engines and in several cases on the footplate, and always found them to do excellent work with heavy trains. I much regret that, for some reason unknown to me, they have been broken up after only a comparatively short span of existence. They probably did not fit in with the more recent Horwich standard patterns, and excessive standardization is like unto charity in that it occasionally covers a good many sins.

The 0–6–2 type of tank engine, now so common on British railways, is a product of the Lancashire and Yorkshire. In 1879 Mr. Wright decided to rebuild and convert the later Jenkins 0–6–0 goods engines of 1864–7 into tank engines, and at the end of that year one of them, No. 333, was turned out from Miles Platting as a 0–6–2 passenger side tank engine. The coupled wheels were 4 ft. 10 in. diameter, and the cylinders 16 in. by 24 in.; in fact most of the original framing, cylinders, wheels and motion were used again. The new trailing wheels were provided with Webb's radial axleboxes, and this rebuilt engine was running nearly two



Photo] [*The Vulcan Foundry, Ltd.*

STANDARD 4-4-0 EXPRESS ENGINE, NO. 924.

W. Barton Wright's design modified with Mr. Aspinall's pendulum link bogie.
Coupled wheels, 6 ft. Bogie wheels, 3 ft. Cylinders, 17½ in. by 26 in.
The Vulcan Foundry built 16 of these engines in 1887.

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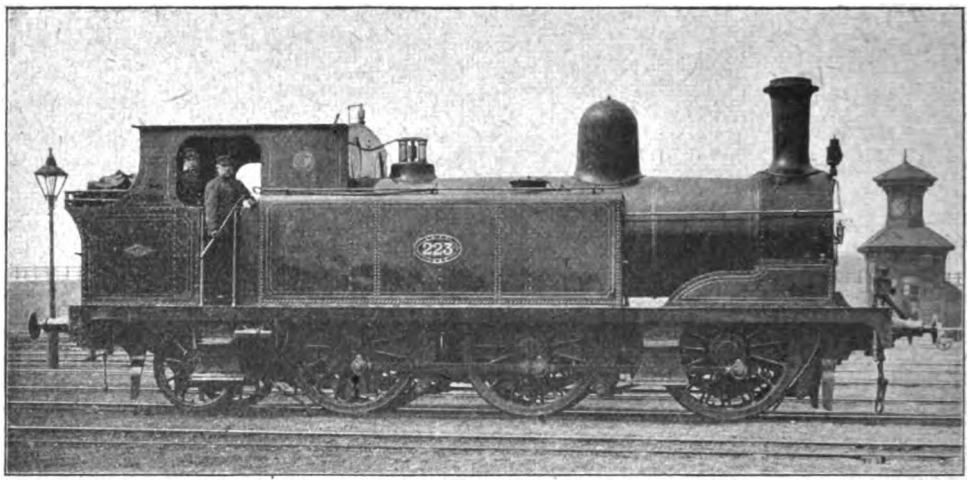

Photo] [*Locomotive Publishing Co., Ltd.*

W. BARTON WRIGHT'S STANDARD HEAVY LOCAL PASSENGER TANK ENGINE, NO. 223.
Wheels, 5 ft. 1½ in. Cylinders, 17½ in. by 26 in.
Period, 1881-1882.

years before the London and North Western Railway adopted the same type in 1881. No. 333 was followed in the years 1880 to 1883 by 17 similarly rebuilt sister engines, most of which were quartered at Low Moor. Of these, four, viz.:—326, 348, 368 and 372, were fitted with the Westinghouse brake.

In 1881 it looked very much as if the Lancashire and Yorkshire Railway had decided to adopt the Westinghouse as the standard brake. A fair number of tender passenger and tank engines had been fitted, mostly for Manchester–Bradford and Leeds trains, and the Manchester and Hellifield Scotch connections with the Midland. A year or two later a change came about. Why the automatic vacuum replaced the Westinghouse I do not know, but I rather suspect that the larger and at that time more powerful surrounding companies exercised some influence in the matter.

The line from Miles Platting to Oldham and round to Rochdale is an exceedingly heavy one with a dense passenger traffic, and the rise on the branch line from Middleton Junction to Oldham (Werneth) has a nice little gradient of 1 in 27 to be negotiated. For these branches Mr. Wright designed a more powerful class of 0–6–2 passenger tank engine with coupled wheels 5 ft. 1½ in. and 17½ in. by 26 in. cylinders. There were 14 of these built by Kitson and Co. in 1881,* followed by 40 more by Dübs and Co. in 1882. For a long time these were almost exclusively employed on the local trains in the Manchester district, and it was a long time before any of them filtered through to Yorkshire sheds. These also have almost entirely disappeared, although they were in some respects the handiest engines the Lancashire and Yorkshire Railway probably ever possessed.

When the Jenkins goods engines were rebuilt as passenger tank engines, and the Crewe DX class became as far as practical use was concerned passenger engines, their places on the goods service were taken by Mr. Wright's much heavier standard 0–6–0 engines with 4 ft. 6 in. wheels, 17½ in. by 26 in. cylinders and 140 lbs. pressure. This class always went by the name of the "iron-clads." There were 230 of them, of which 190 were constructed by various makers and 40 at Miles Platting. Mr. Aspinall added 50 more of them in 1887, with cast steel instead of the previous wrought iron wheels. The 230 original engines of 1876–1885 are still at work, but were converted long since into the present standard shunting saddle tank engines. The later 50, Nos. 928 to 977, with higher boiler pressure, remain as tender engines, and are chiefly employed on coal trains in the Wigan district.

Having completed this condensed account of the principal locomotives, it may be interesting to mention the colour schemes of the Lancashire and Yorkshire Railway for

* One of these, No. 253, together with No. 653, one of the 4–4–0 express engines, went to the Stephenson Centenary at Newcastle in 1881.

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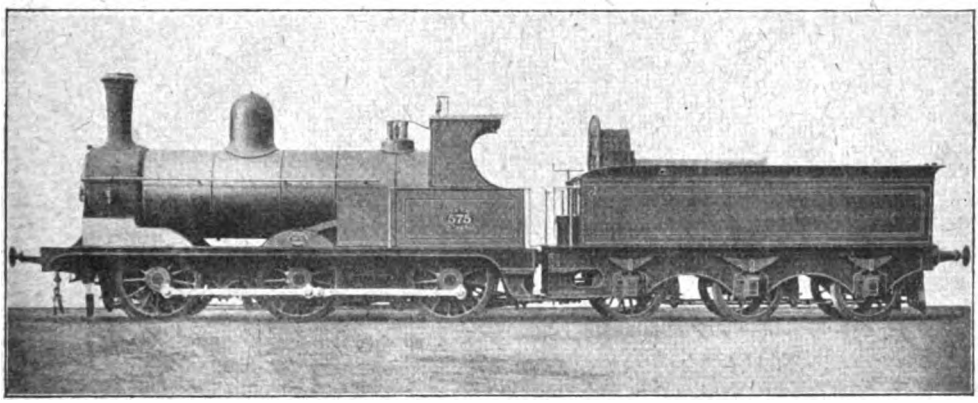
locomotives and rolling stock. Present day readers generally associate the well-known black colour with the engines, but this was not always used. When Mr. Wright took charge in 1876 and for a year or two afterwards the passenger engines of all classes and a number of the goods engines were painted dark green with black bands and white lines. The goods engines were, however, immediately changed to a dead black colour, and by 1878 there were very few dark green ones left. At the same time neat number plates were added on the side panels of all engines, for until then the Lancashire and Yorkshire engines 1 to 527 had large brass figures on the front buffer beams only, and painted numbers on the backs of the tenders or bunkers. The East Lancashire engines 601 to 746 were, however, all provided with number plates on the side panels, and these were the originals of the present style. Between 1878 and 1880 a few shunting engines such as No. 211 were painted brick red, probably as an experiment, but it did not last long. From 1878 Mr. Wright painted all passenger engines light green, almost exactly the same as the then Midland colour, and he adopted the same green for all his "ironclad" goods engines, though all the older goods and shunting engines remained dead black. There was, however, a large variety in the colours of the number plates. All engines built or rebuilt at Miles Platting had vermilion number plates, and a few of these had the outer border painted dark brown. Those of Sharp Stewart's engines were dark indigo, Kitson's generally blue, and the Vulcan Foundry's light blue. All Neilson's were chocolate, and Beyer Peacock's were painted the same green as the engines. There were also a number of very dark brown plates. The present colour for the engines, viz.:—black with red bands and white lines, was introduced by Mr. Wright at the end of 1883, almost exactly at the same time as the Midland abandoned green for their now well-known red.



Photo]. [*The Vulcan Foundry, Ltd.*

W. BARTON WRIGHT'S STANDARD GOODS ENGINE, NO. 575.

Wheels, 4 ft. 6 in. Cylinders, 17½ in. by 26 in.
Period, 1877–1887. No. 575 was one of 65 engines built by The Vulcan Foundry Ltd., Newton-le-Willows. These locomotives were all converted, 1891–1898, into saddle tank shunting engines.

Originally until about 1876 the coaches were of stained wood; afterwards there appeared a large number painted and varnished brown; and the present brown and violet painting dates from about the same period as the black engines, or perhaps was a little anterior to them.

(To be continued.)

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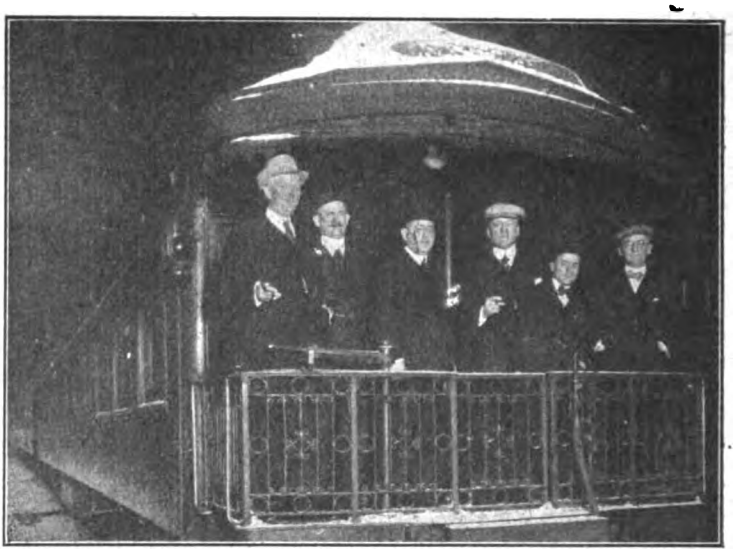

AMERICAN EXPRESS OFFICIALS EN ROUTE TO PACIFIC COAST DURING INSPECTION TRIP OVER COMPANY LINES.

Left to right:—J. A. D. Vickers, Vice-President and General Manager of Western Division; Harry Gee, General Manager, Foreign Department; D. S. Elliott, Vice-President in charge of traffic; G. C. Taylor, President; S. D. Malcolm, Advertising Manager; H. K. Brooks, Vice-President, Financial Department.

The Express System in America.

ORIGIN OF THE COMPANIES.

By R. W. A. SALTER.

EXPRESS is a system particular to North America. In addition to domestic activities, the express companies are rapidly assuming a leading part in the extension of foreign trade on lines which will undoubtedly help to foster profitable business relations between Great Britain and her overseas dominions and the United States of America.

While practically an agency of the railways, the express companies afford a supplementary service more comprehensive and reasonable in cost than could be provided by the railways themselves. There is no concern in this country which has a service actually comparable. For instance, what falls under the category of express in Canada and the United States is here handled, up to a limit of 11 lbs., through the medium of parcel post; consignments above that weight usually being forwarded by fast or slow goods train. Express matter consists of commodities, other than postal matter, which are carried on passenger trains; and not uncommonly, in view of the bulk of express shipments, trains are composed solely of express cars.

It is difficult to convey a precise idea of the relations between the railways and the express companies. A contract entered with a railway is exclusive; for example, the American Express Company works over the New York Central Railway, which precludes others from acting likewise. In this way railways are absolved from responsibility other than the physical act of transportation.

Express is distinguishable from freight in that consignments are collected by wagon, insured up to $50, receipted, and conveyed by fast passenger train for delivery to destination as per address; while, on the other hand, the final delivery of freight is left in the hands of the consignee. The expense of the special service is naturally

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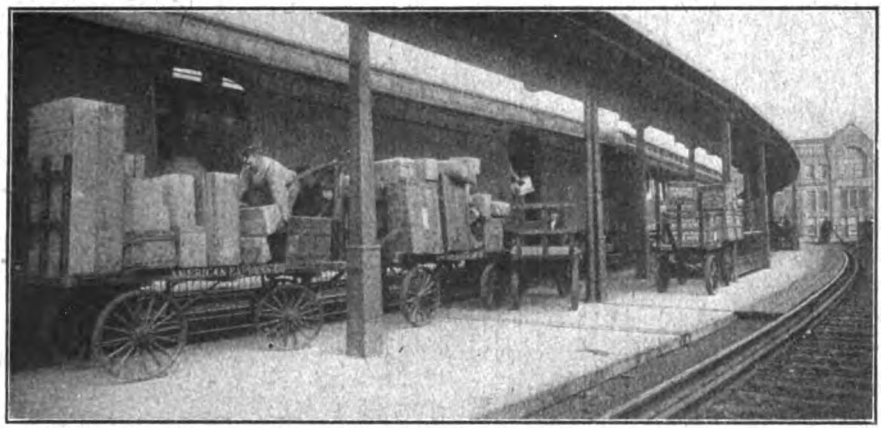


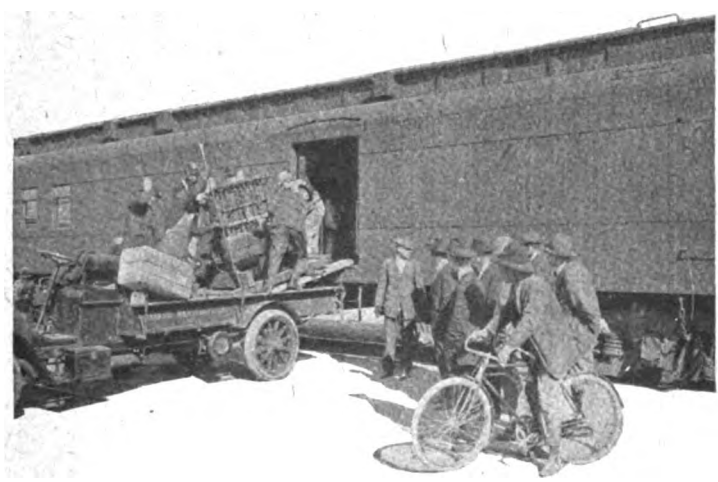
UNLOADING EXPRESS AT WORCESTER, MASS.

higher than the freight charge, a package consigned costing from 2½ to 3 times the freight rate. It is roughly estimated that last year 300,000,000 packages were handled by express in the United States, every one of which had to be receipted for, weighed, priced, waybilled, transported, assorted at destination, written up on delivery sheets, and charges collected from the consignee (unless prepaid).

Express rates have been regulated by the Interstate Commerce Commission since 1906, and are based in the following manner:

A flat allowance of 25 cents per consignment for collection and delivery; a rail terminal allowance of 20 cents per 100 lbs., excepting in the Rocky Mountain districts, where it is 55 cents; a charge for carriage varying according to distance and weight. On 2nd-class matter rates are not in excess of 75 per cent. of 1st-class rates, and 3rd-class are 1 cent. for each ounce of fraction thereof, the minimum being 15. The map of North America is divided into a fixed number of blocks, by which agents are enabled to compute the rates between points.

A portion of the gross receipts from express traffic, amounting from 40 to 60 per cent., is accounted to the railways. The last official report shows that the annual gross receipts were $146,116,316, of which $69,917,562 were paid to the railways. Estimates also indicate that the payments of the express companies provided about 3 per cent. of the entire railway operating railway revenue; which means that the express furnishes the largest individual patronage to the railways. In 1914 the Government paid, for the carriage of postal matter, 1·81 per cent. of the total railway operating revenue.



LOADING MACHINERY ON WESTERN PACIFIC TRAIN AT STOCKTON, CAL.

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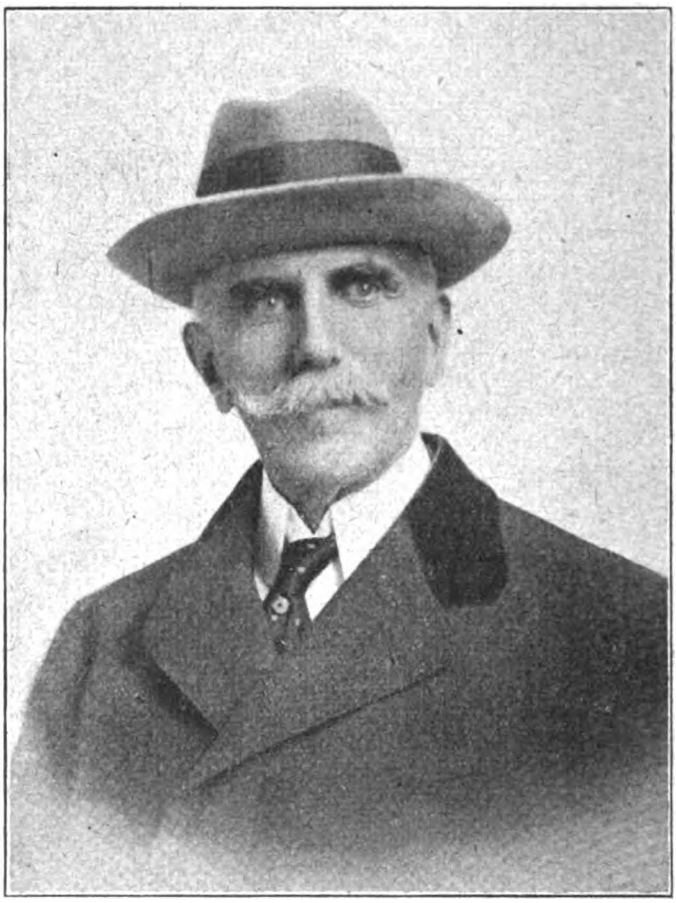
An important chapter in express history deals with their competition with the Post Office. Some time before the Government was in a position to transmit letters in unsettled parts of America, the early express companies were handling these intimate and necessary exchanges of correspondence. When express was established in New York the Government was charging 25 cents for



MR. W. S. DALLIBA,
Director-General in Europe of the American Express Company.

stamps to carry a letter from New York City to Buffalo, while service between the points named was offered at 6 cents by Henry Wells, who naturally secured the business. This aroused official anger, and the Government remanded him for carrying letters. Wells entered a law-suit, which he won; and the Government reduced the price to 3 cents. Competition was renewed and the legal case re-opened in the Supreme Court, with the result that judgment was entered against Wells.

The aggregate mileage of express companies working on steam railways, electric lines, steamships and stage-coaches, is officially stated to be 301,878 miles, of which 8,266 are on electric lines, 40,703 on steamships, and 969 on stages. The total annual transportation business is near to $160,000,000.

There has never been rate-cutting among the express companies themselves; and in the carriage of shipments over routes to which their own operations do not extend they join in a single unit of service. Nevertheless, there is keen competition for securing traffic.

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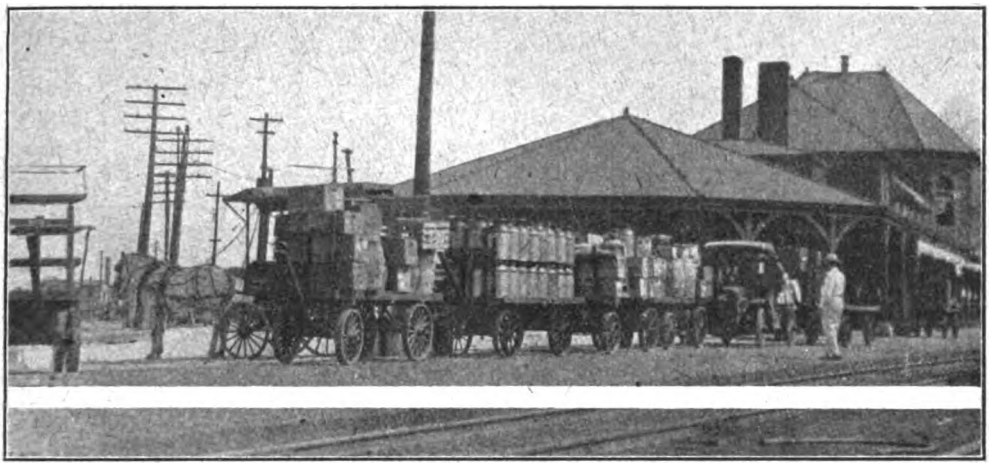

OUTBOUND SHIPMENT AT SEDALIA, MO.

As an illustration of the express companies' work, let us assume ourselves at one of the large New York railway terminals. Here express parcels, when each has been waybilled, are thrown into bins, the latter then being loaded on trains for their respective destinations. The number of consignments for a large city like Chicago or San Francisco will generally justify a complete carload, which will travel untouched until its arrival there. Packages destined to different nearby points are accompanied in the train by an express messenger, who sorts them *en route*, and puts them off at the stations for which they are marked (where they will be received and dealt with by the local express agent), generally at the same time receiving a fresh load. Express cars are equipped with safes for the transit of valuables. Where traffic is not exceptionally heavy, perhaps a portion of a baggage or mail car, or a passenger coach, is reserved for express. The railways afford the cars, but the cars are lettered with the express company's title. About 50 special fast trains, with 6 to 12 cars each, carrying express matter only, cross the United States from coast to coast each week-day of the year.

The C.O.D. ("collect on delivery") is a simple and effective method of selling merchandise without risk to the owner and shipper. Approximately 5,000,000 C.O.D. consignments are handled yearly by the express companies.

The handling of parcels is by no means the most important phase of the express

SHIPMENT OF HATS FROM STETSON FACTORY IN PHILADELPHIA, PENNA.

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industry. The tasks undertaken are numerous and varied, and it would seem there are few bounds to enterprise. Scarcely a year elapses but some new line of work is planned. Wells-Fargo & Company established a banking section many years ago, and this has now developed to gigantic proportions. The money orders and travellers' cheques originated by the American Express Company, and now issued by the principal express companies in Canada and the United States, form the most popular method of carrying or sending money in the countries named. Travellers' cheques are issued in denominations of $10, $20, $50, $100 and $200, with the foreign money values printed on each cheque, and are practically certified cheques, payable almost anywhere in America and in many places throughout the world. To provide necessary security the purchaser places his or her signature in the upper left-hand corner at the time of purchase, leaving other spaces blank. When necessary to pay hotel bills, or draw money for other purposes, the cheque is completely filled in by inserting the name of the town, date, and to whom payable; and by placing the signature in the lower left-hand corner in the presence of the person accepting the cheque. By agreement of the two signatures proper identification is established. Money orders and foreign cheques are generally used for sending through the post.

The American is the pioneer express company, and was established in 1841. Its operations at the present moment extend over 73,485 miles of railway, reaching direct and through connections upwards of 30,000 cities and towns in Canada and the United States. There are 30,000 employees.

Adams Express Company, organised in 1854 by Alvin Adams, now operates over 120,000 miles of railway and water-road, maintaining 12,000 offices. The Southern Express Company was recently absorbed, and the capital of the combined concerns amounts to $24,000,000.

Wells-Fargo & Company was established in California in 1852 by Henry Wells, to whom reference has been made earlier in this article. This company commenced handling small remittances of money; and banking is now a firmly established branch of express functions.

There are, of course, numerous smaller companies. It is worthy of note that two of the large railways maintain their own service; namely, the Northern Pacific Railway (Northern Express), and the Great Northern Railway (Great Northern Express). The Northern works over 8,233 miles, producing an income of $2,778,000; the Great Northern over 9,582 miles, the income being $3,000,000.

The Dominion Express Company was assented to in 1873 by Statutes of Canada, 36 Victoria, Chapter 113, and has an exclusive contract with the Canadian Pacific Railway. The Western Company was formed 21 years later.

Activities are not merely confined to America, but extend to Europe, where the more important concerns maintain their own organisation. The American has opened offices in Hong Kong, Manila and Buenos Ayres, in addition to those in the principal cities of Europe, and expects (the writer is informed) a wide development in traffic to the Far East after the war. Exports from parcels to carloads are forwarded; and through negotiable bills of lading issued for heavy goods to and from points in countries foreign to the United States.

Much of the work transacted in Europe and the Far East consists (or did prior to the war) in passenger, especially tourist, traffic. The American Express Company acts as European representative of the New York Central Railway, etc., and a general passenger agent at the headquarters devotes his attention to this part of the work.

Mr. William S. Dalliba, whose portrait is reproduced on page 242, is director-general of the American Express Company's European organisation. His first connection with the American Express Company was in 1869, although he twice left their service to engage in other enterprises. In the '70's he was engaged in mining in the State of Idaho, and for a time acted as justice of peace in that state. In the late '80's Mr. Dalliba was in charge of the Green Bay (Wisconsin) division of the American Express Company; and in 1893 he was superintendent of the special service organised by the company in the grounds of the World's Columbian Exposition in Chicago. He was sent to Paris in 1894, and later elected director-general in Europe.

Since the advent of war the European headquarters of the American Express Company (although normally in Paris) have been transferred to London, but will shortly be moved back to Paris, as the arrival of the American Expeditionary Force in France will entail a considerable increase in most branches of the company's business.

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Non-Stop Runs in Canada and the United States.

By EDWIN J. MILLER.

WITH two exceptions the tables given in this article are compiled from the official documents of the railroads concerned, and for the collection of the necessary data—which occupied some considerable time—the author claims the indulgence of the reader, in that the dates of the various runs are spread over a period.

However, the runs have been corrected to date where the official details are available, so the result presented is substantially the same as that pertaining at the entrance of the United States of America into the world war.

This action has, of course, affected the train services, but that incidence is outside the scope of this article.

No comparison can be instituted between the "non-stop" runs of the British Isles and those of Canada and the United States.

The physical characteristics of the country traversed, the density of population in many States, the great length of the train journeys —in many instances over 1,000 miles—and the very limited train service per day over a large mileage of the country make the impossibility of comparison obvious.

Long stretches of single line are encountered in all parts, and many of the runs are dependant upon the trains meeting and passing at the appointed stations on schedule time, also in case of necessity stops are made at water "tanks" erected at places (other than stations) where a suitable supply can be obtained.

A great number of townships, particularly in the Southern District, have bye-laws limiting the rate of speed through their area, in some cases to 4 m.p.h.

On many trans-continental railroads the train service is limited to two, three or four trains each way per day, and it is only by one more of the services being of an express character that unnecessary stops are eliminated and quicker time made.

Indeed, a number of runs can be attributed to the lack of traffic to be obtained *en route* between the points served, the passenger traffic carried being of a long distance nature. This latter remark especially applies to the "Extra Fare" trains and Trains de Luxe, of which a number exist, more particularly at certain travel seasons, viz., winter and spring.

The same conditions of travel also apply to Canada, all of the runs included under this heading being of a trans-continental nature.

For the purpose of railway statistics the U.S.A. is divided into three sections, and this grouping is adhered to in the subjoined tables.

Runs taking place on "mountain gradients," *i.e.*, gradients steeper than 53 ft. per mile (1 in 100), are shown thus in the note column "Z," where this information is available.

The total number of runs per railroad and per district is shown in brackets thus (123).

Note.—The runs hereunder are inclusive of those containing up to three "conditional" stops (as shown in the public time-tables), where such stops are not shown as *regular* stops in the "Official" Time-tables.

CANADA (29).

Railway and Run.	Miles.	No. of Trains.	Time of Best.	No. of Best Train.	Speed.	Double or Single Line.	Notes.
CANADIAN PACIFIC. (4/6/16) (21)							
Ottawa (Cent.)-Montreal (Windsor St.)	115·5	1	3·00	2	38·5	S	..
Minnedosa-Bredenbury	118·3	2	4.35	51	25·7	S	..
Cartier-Chapleau	136·4	2	4·20	3	31·4	SD	..
Chapleau-White River	131·8	2	4·20	4	30·0	SD	..
White River-Schreiber..	118·3	2	4·00	3	29·6	SD	..
Fort William-Ignace	147·2	4	4·05	4	36·0	D	..

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Railway and Run.	Miles.	No. of Trains.	Time of Best.	No. of Best Train.	Speed.	Double or Single Line.	Notes.
Ignace–Kenora	146·2	2	4·10	..	35·0	D	L
Kenora–Winnipeg Westbound ..	132·8	1	3·50	..	34·5	D	L
,, ,, Eastbound ..	125·9	1	3·50	..	32·8	D	L
Moose Jaw–Swift Current	110·5	4	3·20	2	33·0	D	..
CANADIAN GOVERNMENT. (18/6/16) (8)							
St. Rosalie Junction–Chaudiere ..	115·6	2	3·00	44	38·5	S	D
St. Charles Junction–Rivere du Loup	101·0	2	2·50	44	35·6	S	D
Parent–Doucet	103·0	2	4·50	..	21·3	S	L
Graham–Redditt	124·0	2	3·50	4	32·3	S	L

EASTERN DISTRICT, U.S.A.

The territory comprised in the Eastern District is analogous for the most part, to circumstances in England, as to population and traffic. Relatively to mileage of train services, the number of runs is the smallest of the lines under review, and this is accounted for by the fact that several railroads with mileages of over 1,500 have no runs of over 100 miles, the centres of traffic being situated close to each other and the train services complex and dense.

The most important railroads in this division not having 100 runs are the Boston and Maine, New York, New Haven and Hartford, Philadelphia and Reading, Cincinatti, Hamilton and Dayton and Wabash, with a combined mileage of 10,165 route miles.

EASTERN DISTRICT (208).

Railroad and Run.	Miles.	No. of Trains.	Time of Best.	No. of Best Train.	Speed.	Double or Single Line.	Notes.
BALTIMORE AND OHIO. (16/7/16) (7)							
Garrett–Gary	116·8	5	2·26	22	48·0	SD	..
Milford Junction–Chicago	112·6	1	3·02	13	37·2	SD	M
Chicago Junction–Garrett	128·0	1	2·50	13	45·2	S	M
CLEVELAND, CINCINNATI, CHICAGO AND ST. LOUIS. (7/5/16) (3)							
Mattoon–St. Louis	124·1	1	3·25	27	36·3	DS	..
Troy–Indianapolis	115·0	2	2·36	30	44·2	S	..
CHICAGO AND EASTERN ILLINOIS. (18/10/14) (5)							
Chicago–Villa Grove	145·1	2	3·15	27	44·6	DS	M
Chicago (Englewood)–Villa Grove ..	138·7	2	3·27	23	40·3	DS	..
Chicago–Danville	116·8	1	3·00	95	38·9	D	..
ERIE. (25/6/16) (1)							
Huntingdon–Chicago	142·9	1	4·07	13	34·7	SD	M
LEHIGH VALLEY. (26/11/16) (2)							
Buffalo–Geneva	103·1	2	2·10	6	47·6	D	..
MICHIGAN CENTRAL. (18/10/14) (20)							
*Buffalo (Bridgeburg)–St. Thomas ..	118·2	5	2·06	48	56·1	D	M2
*St. Thomas–Welland	100·9	2	1·50	8	55·0	D	..
* ,, –Falls View (Niagara Falls)	112·4	1	2·06	18	53·3	D	..
* ,, –Niagara Falls	114·7	1	2·11	39	52·6	D	M
* ,, –Windsor	109·6	10	2·00	48	54·8	D	M4
Detroit–Niles	190·5	1	4·03	39	46·9	D	M
PERE MARQUETTE. (18/6/16) (2)							
Grand Rapids–Traverse City	147·6	2	4·55	9	30·1	S	D
NEW YORK CENTRAL. (27/6/15) (49)							
New York (30th Street)–Albany ..	141·8	4	3·33	27	40·0	D	M4S
Harmon–Albany	109·6	23	2·08	51	51·5	D	M1

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Railroad and Run.	Miles.	No. of Trains.	Time of Best.	No. of Best Train.	Speed.	Double or Single Line.	Notes.
Peekskill–Albany	101·6	1	2·04	59	49·3	D	..
Albany–Syracuse	147·4	2	2·58	25	50·0	D	..
Syracuse–Buffalo (Clinton Street) .	152·1	1	2·58	26	51·2	D	..
Cleveland– ,, ,, .	183·3	2	3·36	11 & 25	50·0	D	..
Cleveland (105th Street)– ,, ..	175·5	2	3·34	26	49·3	D	..
Buffalo (Exchange Street)–Ashtabula	127·7	1	2·45	72	46·6	D	..
Cleveland–Toledo	106·7	6	2·15	25	47·5	D	..
Toledo–Elkhart	133·0	7	2·30	26	53·2	D	..
PENNSYLVANIA (EAST OF PITTSBURG). (26/11/16) (88)							
New York (Manhattan T.)–Harrisburg	181·0	2	3·45	37	48·2	D	..
Trenton–Harrisburg	131·7	3	2·53	55	45·7	D	M
Philadelphia (North)–Harrisburg .	105·6	15	2·09	28 & 29	49·0	D	M1
,, (West)– ,, .	102·8	10	2·14	25	46·0	D	M1
,, (Broad St.)– ,, .	103·9	5	2·00	13	51·9	D	M4
Harrisburg–Altoona	130·8	34	2·45	28	47·6	D	M7
,, –Tyrone	116·6	2	2·26	25	48·0	D	..
Altoona–Pittsburg	113·8	9	2·38	29	43·3	D	M5
,, ,, (East Liberty) ..	109·3	8	2·37	16, 40 & 52	42·0	D	..
PENNSYLVANIA (WEST OF PITTSBURG). (26/11/16) (31)							
Pittsburg–Canton	101·3	1	1·58	23	51·3	D	E
,, –Crestline	188·7	2	4·14	29	44·6	D	E
,, (Allegheny)–Crestline ..	187·7	2	4·55	5	38·2	D	E
Crestline–Fort Wayne	131·6	6	2·32	29	52·1	D	E
Fort Wayne–Chicago (Englewood) ..	141·0	10	2·54	28	48·6	D	E
Pittsburg–Newark	157·8	1	3·42	31	42·7	D	E
,, –Columbus	190·9	1	4·30	30	42·4	D	E
Newark–Steubenville	114·6	1	2·50	144	40·6	D	..
Logansport–Richmond	107·6	2	2·37	207	40·9	S	..
,, –South Chicago	101·7	2	2·33	206	40·0	D	..
,, –Chicago (Englewood) ..	107·2	3	2·29	216	43·0	D	..

* These runs are made on Canadian Territory.

SOUTHERN DISTRICT, U.S.A.

This district is almost purely agricultural and consequently the passenger travel is smaller than the other districts.

As will be seen by the tables, a large proportion of the runs are performed by the season trains, running to and from Florida.

The following railroads with a total mileage of 8,690 have no runs of over 100 miles:—Central of Georgia, Chesapeake and Ohio, Mobile and Ohio, Nashville, Chattanooga and St. Louis and Norfolk and Western.

SOUTHERN DISTRICT (49).

Railroad and Run.	Miles.	No. of Trains.	Time of Best.	No. of Best Train.	Speed.	Double or Single Line.	Notes.
ATLANTIC COAST LINE. (3/1/16) (6)							
Richmond–South Rocky Mount ..	120·6	2	3·05	87	39·4	D	D
South Rocky Mount–Florence ..	172·3	2	4·00	87	43·1	DS	D
Charlestown (Bennett)–Savannah ..	108·1	2	2·40	88	40·1	S	D
ILLINOIS CENTRAL. (15/11/16) (10)							
Chicago (63rd Street)–Champaign ..	120·0	2	2·42	7	44·4	D	..
Cairo–Memphis	170·4	2	4·30	8	37·9	D	..
Fulton– ,, ...	120·8	2	3·30	3	34·5	D	..
Memphis–Grenada	101·3	2	2·28	7 & 8	40·0	S	..
Jackson–New Orleans	183·2	2	4·10	8	40·3	D	..
LOUISVILLE AND NASHVILLE. (1/12/14) (8)							
Cincinnati (Latonia)–Louisville (B.Av.)	104·4	4	2·49	1	36·9	S	..

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Railroad and Run.	Miles.	No. of Trains.	Time of Best.	No. of Best Train.	Speed.	Double or Single Line.	Notes.
Corbin–Knoxville	104·6	2	2·56	32	35·7	S	..
Etowah–Atlanta	136·5	2	3·28	32	39·2	S	..
SEABOARD AIR LINE. (3/1/16) (14)							
Richmond–Johnson Street	156·2	2	3·45	9	41·6	S	D
Hamlet–Columbia	106·2	4	2·40	8 & 10	40·0	S	No. 10 D
Columbia–Savannah	141·8	2	3·35	9	39·6	S	D
Savannah–Jacksonville	138·5	2	3·40	10	37·6	S	D
Jacksonville–Ocala	101·5	2	2·57	9	34·2	S	..
Birmingham–Cedartown	106·3	2	3·04	6	34·5	S	..
SOUTHERN. (25/9/16) (7)							
Washington (Alexandria)–Charlottesville	106·1	5	2·40	37	39·9	D	..
Macon–Jesup	147·6	2	4·25	1	33·5	S	..
WASHINGTON SOUTHERN. (3/1/16) (4)							
Washington–Richmond (Acca) ..	111·2	2	2·50	99	39·0	D	D
„ „ (Elba) ..	114·2	2	3·00	87	38·0	D	D

WESTERN DISTRICT, U.S.A.

This district comprises a diversity of territory, mountain and prairie, and has more than one half of the total mileage of the railroads in the United States. It is the country of "long distances," there being 11 railroads each having a trunk line over 1,000 miles in length, that of the Atchison, Topeka and Santa Fe being 2,263 miles.

Some eight railroads, viz., Chicago, Burlington and Quincy, Chicago Great Western, Colorado and Southern, Denver and Rio Grande, International and Great Northern, Minneapolis and St. Louis, Missouri Pacific and Oregon-Washington, with a total mileage of 23,218 miles, have no runs of 100 miles and over.

WESTERN DISTRICT (251).

Railroad and Run.	Miles.	No. of Trains.	Time of Best.	No. of Best Train.	Speed.	Double or Single Line.	Notes.
ATCHISON, TOPEKA AND SANTA FE. (7/2/15) (69)							
Chicago–Chillicothe	130·1	5	3·05	19	42·1	D	EL
Chillicothe–Shopton	104·5	5	2·30	20	41·8	D	EL
Shopton–Marcelline	112·7	5	2·30	15	45·0	D	..
Marcelline–Kansas City	103·8	5	2·44	7	38·7	D	..
Kansas City–Emporia (*viâ* Ottawa Jn.)	110·1	4	2·50	19	39·0	D	EL
Newton–Dodge City (*viâ* St. John) ..	153·1	5	3·35	7	44·3	S	..
Dodge City–Syracuse	101·4	5	2·21	7	42·7	S	..
Syracuse–La Junta	101·0	5	2·20	4 & 20	43·3	S	No. 20 EL
Raton–Las Vegas	110·6	7	2·55	9	37·9	S	Z
Las Vegas–Albuquerque	132·3	5	4·35	3	29·1	S	Z
Albuquerque–Gallup	161·5	5	4·25	20	36·5	SD	EL
Gallup–Winslow	127·9	5	2·50	19	45·2	S	EL
Seligman–Needles	149·2	4	3·45	19	39·9	SD	ELZ
Needles–Barstow	169·0	4	4·15	20	39·8	SD	EL
CHICAGO AND ALTON. (25/3/17) (3)							
Chicago (Un on Stn.)–Bloomington ..	126·6	1	2·50	11	44·6	D	..
„ (Halsted St.)– „ ..	124·0	2	3·06	7	38·7	D	..
CHICAGO, MILWAUKEE AND ST. PAUL. (18/6/16) (1)							
Baker–Miles City	103·7	1	2·44	15	38·0	S	..

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Railroad and Run.	Miles.	No. of Trains.	Time of Best.	No. of Best Train.	Speed.	Double or Single Line.	Notes.
CHICAGO AND NORTH WESTERN. (12/1/16) (6)							
Chicago-Clinton	138·1	2	3·25	1	40·0	D	E
Cedar Rapids-Boone	120·8	2	2·55	2	40·0	D	E
Boone-Council Bluffs	144·9	2	3·25	2	42·4	D	E
EL PASO AND SOUTH WESTERN. (1/3/15) (1)							
Osborn-Tuscon	101·4	1	2·49	3	35·2	S	..
CHICAGO ROCK ISLAND AND PACIFIC. (1/3/15) (15)							
Chicago (Englewood)-Bureau ..	114·2	3	2·17	7	50·0	D	..
Moline-Joliet	139·0	1	3·05	2	45·1	D	..
Norton-Goodland	105·8	2	2·26	8	43·5	S	..
Goodland-Limon	107·1	2	2·20	8	45·9	S	..
Eldon-Davenport	109·7	1	3·09	4	33·6	SD	..
Trenton-Eldon	121·5	2	3·37	3 & 4	33·6	S	..
Liberal-Pratt	136·2	2	3·50	3	35·5	S	..
,, -Dalhart	111·2	2	2·55	3 & 4	38·1	S	..
GREAT NORTHERN. (1/9/14) (19)							
Willmar-Breckenridge	112·4	3	2·19	27	48·3	S	M
Fargo-New Rockford	124·3	2	2·43	27	46·0	S	M
New Rockford-Minot	108·8	3	2·25	27	45·1	S	M
,, -Surrey	101·7	1	2·35	3	37·5	S	..
Minot-Williston	121·1	2	2·42	27	44·9	S	M
Williston-Glasgow	156·3	1	3·13	27	48·5	S	M
Glasgow-Havre	152·7	1	3·10	27	48·1	S	M
Havre-Cut Bank	128·7	4	3·02	27	42·0	S	MZ
Whitefish-Troy	134·6	1	3·25	27	39·6	S	MZ
Troy-Dean	125·7	1	3·18	27	38·1	S	M
MINNEAPOLIS, ST. PAUL AND SAULTE STE MARIE. (11/6/16) (1)							
Minneapolis-Glenwood	122·0	1	3·25	110	35·7	S	..
MISSOURI, KANSAS AND TEXAS. (6/8/16) (10)							
St. Louis-Mokane	125·1	2	2·55	7	42·8	S	..
Mokane-Sedalia	102·0	2	2·30	8	40·0	S	..
Sedalia-Parsons	159·5	2	3·37	7 & 8	44·2	S	..
Parsons-Muskogee	117·6	2	2·32	7	46·1	S	..
Dallas-Waco	100·0	2	2·25	7	40·0	S	..
NORTHERN PACIFIC. (23/8/14) (11)							
Minneapolis-Staples	130·8	2	3·25	2	40·5	D	..
Staples-Dilworth	105·4	4	2·35	2	40·8	D	..
Forsyth-Billings	101·6	2	2·30	2	40·6	S	..
Paradise-Rathdrum	159·1	1	4·36	4	32·5	S	Z
Billings-Livingstone	115·7	2	3·03	2	37·9	S	..
ST. LOUIS-SAN FRANCISCO. (24/5/14) (1)							
Dallas-Paris .. .. (This run is made over another Co.'s railway)	100·5	1	3·30	4	29·0	S	..
ST. LOUIS, IRON MOUNTAIN AND SOUTHERN. (7/5/16) (9)							
St. Louis-Poplar Bluff	165·6	2	4·28	1	37·9	SD	..
Little Rock-Hoxie	118·2	4	2·50	2	41·4	DS	..
Texarkana-Little Rock	145·0	3	3·10	2	45·7	SD	..
ST. LOUIS SOUTH WESTERN. (21/5/16) (4)							
Pine Bluff-Texarkana	151·8	2	4·10	5	36·5	S	..
Texarkana-Greenville	132·5	2	3·23	5	34·0	S	..

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Railroad and Run.	Miles.	No. of Trains.	Time of Best.	No. of Best Train.	Speed.	Double or Single Line.	Notes.
SAN PEDRO AND SALT LAKE. (7/2/15) (8)							
Salt Lake City-Lynndyl	117·7	2	3·30	8	33·6	S	..
Milford-Caliente	117·3	2	3·10	8	37·0	S	..
Caliente-Las Vegas	125·3	4	3·35	7	35·0	S	..
SOUTHERN PACIFIC. (1/3/15) (44)							
Avondale-Lafayette	132·9	2	3·28	102	38·3	SD	..
Lafayette-Echo	106·6	2	2·52	102	37·1	S	..
Echo-Houston	109·8	2	3·02	102	36·6	SD	..
Houston-San Antonio	212·6	2	6·00	102	35·4	S	..
San Antonio-Del Rio	169·2	2	4·50	101 & 102	35·0	S	..
Del Rio-Sanderson	137·3	2	4·06	101	33·5	S	..
Valentine-El Paso	160·9	2	4·45	102	34·0	S	..
Los Angeles-Santa Barbara	104·1	4	3·15	All	32·0	DS	..
Santa Barbara-San Luis Obispo ..	118·6	3	3·27	76	34·2	S	..
San Luis Obispo-Salinas	133·9	3	3·41	75	36·3	S	..
Tracy-Fresno	126·2	2	2·50	26	44·5	S	..
Fresno-Bakersfield	107·4	2	2·45	25 & 26	39·0	S	..
Mojave-Los Angeles	103·0	2	3·30	26	29·4	S	Z
Ogden-Montello	120·4	4	3·22	2	35·7	SD	E
Montello-Carlin	127·4	3	3·11	9	40·0	S	M1
Carlin-Imlay	150·2	3	3·22	2	44·5	SD	E
Imlay-Sparks	138·1	2	3·17	2 & 9	42·0	SD	No. 2E
Davis-Red Bluff	122·4	2	3·05	12	38·0	S	E
TEXAS AND PACIFIC. (7/5/16) (1)							
Dallas-Longview Junction	123·9	2	3·10	2	39·0	S	..
UNION PACIFIC. (2/1/16) (48)							
Omaha-Grand Island	152·6	2	3·20	1 & 2	43·3	D	E
Grand Island-North Platte	137·3	4	3·07	5	44·1	D	M1
North Platte-Sydney	123·3	3	2·47	5 & 9	44·3	D	M2
Sydney-Cheyenne	102·0	10	2·25	2	42·0	DS	E
Laramie-Rawlins	116·8	11	2·49	5	41·5	D	M
Rawlins-Green River	134·4	1	3·32	9	38·0	DS	M
Rawlins-Rock Springs	119·4	9	3·16	1	36·7	DS	E
Green River-Evanston	100·2	8	2·43	1	36·8	SD	E

NOTES (*for all Lines*).

D—Season train—DAILY for a limited period.
E—"Extra Fare" train.
L—Season train—Certain days only for a limited period.
M—Mail train only.
S—First 10 miles of run at limited speed of 8 m.p.h.
M1—Includes one mail train.
M2—Includes two mail trains (and so on).

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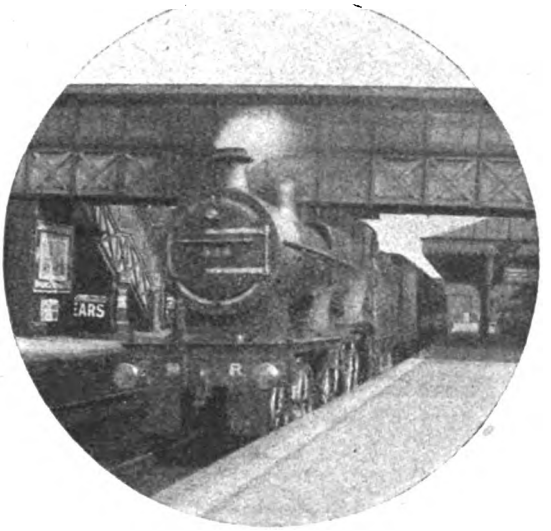
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*F. H. Stingemore.*

MIDLAND RAILWAY.
Down stopping train entering Radlett station.
Rebuilt 4–4–0 superheater engine.

A LETTER from a reader raises some important points in connection with the thorny problem of compound *v.* simple locomotive propulsion, and it may be worth while to devote brief attention to the subject. He first of all quotes the late Mr. Charles Rous-Marten, who in February, 1908, remarked in these columns, "On these (*i.e.*, 1 in 125 and 1 in 200 slopes) and easier grades and on the level the work achieved by the du Bousquet-de Glehn 4–4–2 compounds has never been equalled in my experience by any other engines of any type or class whatsoever. I have yet to see the following feats which were performed under my own observations by locomotives of the du Bousquet-de Glehn order equalled by *any* other class of engine, viz. :—(1) attaining 75 m.p.h. up 1 in 200 with 156 tons behind the tender, after starting from a dead stop on that grade ; (2) attaining that rate up the same gradient with 170 tons ; (3) maintaining 75 m.p.h. along a dead level with 305 tons behind the tender ; (4) sustaining a rate of 62·1 m.p.h. unwaveringly up 1 in 200 for 13 miles with 309 tons behind the tender. I still await the accomplishment of the like performance by any other locomotive of any other type, and shall be only too delighted to have the opportunity of recording it if achieved."

"I should be interested to know," my correspondent adds, "if you have ever equalled or surpassed these records of Mr. Rous-Marten's observations. A few months ago you mentioned some of the finest feats that you had recorded : I can't give details, as the volume is in the hands of the binder, but as far as I can remember 80·3 m.p.h. on the level was recorded by you as against Mr. Rous-Marten's 75, but with a much smaller load than 309 tons. As an offset the engine, I think, was a 4–4–0 of the North Eastern Railway 'R' class—a much smaller machine than a Nord 'Atlantic.' Mr. Rous-Marten's feats Nos. 1, 2 and 4, however, seem to me on reflection altogether extraordinary, and I cannot remember seeing anything like such high speeds up a 1 in 200 grade recorded elsewhere. I see that at various times Mr. Rous-Marten expressed himself in favour of compounding—at any rate as against multi-cylinder simple expansion. Your view, if I recollect aright, is that compounding gives little or no improvement except where coal is indifferent or expensive or both, and that the improvement is mainly on the economic side." The writer then draws attention to the excellent series of articles which have lately appeared in our contemporary *The Locomotive* concerning the results that have been obtained on the Paris, Lyons and Mediterranean Railway of France with compound superheater "Pacific" type locomotives, and emphasises that the Paris, Lyons and Mediterranean Company has reverted definitely to compounding—in conjunction with superheating and high-pressure steam. These engines have proved themselves superior, after exhaustive tests, in both performance and economy, to

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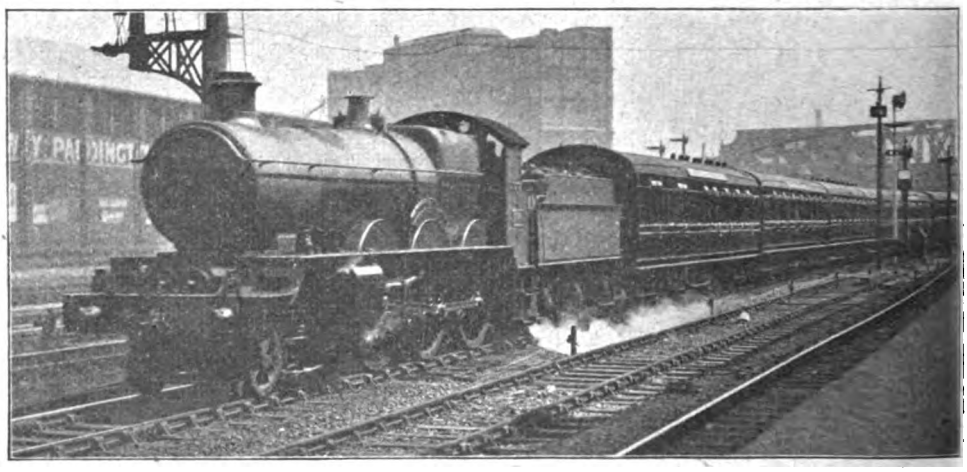
4-cylinder simple superheater engines of the same dimensions, in the same ratio as the latter were found superior to corresponding compound "Pacifics" without superheaters.

It is worth while to quote from *The Locomotive* some of the results mentioned above. The tests took place between Laroche and Dijon, on the continuous ascent of 1,020 ft. from Laroche to Blaisy-Bas. For the first 63¼ miles, to Les Laumes, this is gradual, not exceeding 1 in 200 in steepness at any point, and averaging perhaps 1 in 300 to 500. The concluding length of 19½ miles to the summit is steeper, being mostly at 1 in 200, save the concluding 8 miles, a considerable proportion of which are at 1 in 125 to 140. Up the former stretch the compound engine averaged 69 m.p.h. with 274 tons, 65·6 m.p.h. with 378 tons, 59·5 m.p.h. with 481 tons and 56·5 m.p.h. with no less than 635 English tons behind the tender. On the steeper ascent the figures on the same occasions were 65·6, 61·4, 54·8 and 49·2 m.p.h., but on another run with the same load as that in the last-mentioned instance, an average of 50·6 m.p.h. was maintained. The figures with the simple 4-cylinder engine were, on the flatter incline, 65·4 m.p.h. with 274 tons, 62·5 m.p.h. with 379 tons and 58·3 m.p.h. with 480 tons; and on the steeper ascent 63·8, 58·4 and 53·8 m.p.h. respectively.

Far more striking than the superiority of the compound over the non-compound engine in performance, however, was the extraordinary economy in water and fuel. For example, the consumption of coal, excluding firing up, in the three last-mentioned instances was 4,020, 3,860 and 4,230 kilogrammes, while the compound engine only burned 2,627, 2,816 and 2,982 kilogrammes respectively with the same loads at the higher speed, and even worked the 635 ton train on a total consumption of 3,206 kilogrammes. In these last four cases cited, the consumption per mile works out at 70, 75, 79 and 85 lbs. respectively. This may seem a heavy figure, but it must be remembered that the fuel employed is of much inferior quality to that in use over here. The most economical results in relation to the tractive power developed were realised when the compound engine was hauling the 635-ton load, thus showing that the locomotive was in no way thrashed; in these circumstances the average consumption of fuel was only 2·05 lbs. per i.h.p. hour. Similarly with water, the figures for the non-compound were 22·38, 24·65 and 26·32 cubic metres on the three runs given above, and for the compound 16·30, 18·69 and 19·66 cubic metres respectively under the same conditions, or 22·23 cubic metres when hauling 635 tons. Such figures, of course, speak emphatically for themselves. In appraising such results, also, it should be clearly remembered that high speeds were being maintained over a route rising on the



Photo] [*F. E. Mackay.*

GREAT WESTERN RAILWAY.

Plymouth express leaving Paddington.
4-cylinder 4–6–0 engine, No. 4060, *Princess Eugenie.*

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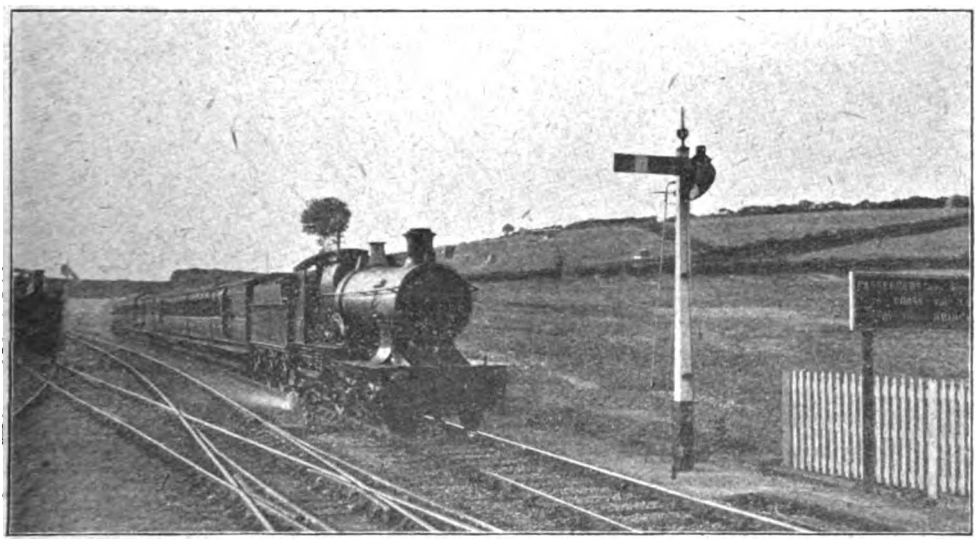
average 12½ ft. per mile for over 80 miles on end, and with loads which in the last-mentioned instance aggregated a full 50 per cent. above what we consider in this country as a very substantially loaded express. At the same time, the engines concerned are very large and powerful, weighing each in working order 90 tons exclusive of tender, and having boilers pressed to 228 lbs. per sq. in.

In the same connection I received recently a letter from Lord Monkswell, who drew my attention to several performances of French compounds—principally the "Atlantics" of the Nord Company—which he has described in his excellent little treatise on "French Railways." The limitation of space does not allow me to reproduce these, but I cannot refrain from quoting some of Lord Monkswell's more recent experiences with the Nord "Pacifics," as detailed in his subsequent volume "The Railways of Great Britain." These are 4-cylinder compound engines of the du Bousquet-de Glehn type, with Schmidt superheaters, working at 228 lbs. per sq. in. pressure, and weighing without tenders a little over 84 tons each, in running order. The tests were made in the majority of instances on the outward journeys from Paris, up the ascents to Survilliers, between Paris and Creil, Gannes, between Creil and Amiens, and Caffiers, between Boulogne and Calais. Survilliers bank extends from kilometre post 7 to post 27, and thus has a length of 12½ miles; most of this is at 1 in 200, but a few intervening strips of easier grades make the average figure about 1 in 230. Gannes bank is not so severe, but for 8 miles from kilometre post 66 averages 1 in 265, and for 4 miles beyond to the summit 1 in 310. But Caffiers bank, although only 5½ miles long, is almost entirely at 1 in 125.

On the first run, with 292 tons behind the tender, engine No. 3.1156 attained the mile-a-minute rate in 2¼ miles from the start, helped by the smart descent to St. Denis, and passed post 7 (4⅜ miles) in 5 min. 56 sec. The ascent of the bank was commenced with the regulator wide open and steam cut off at 55 and 65 per cent. respectively in the H.P. and L.P. cylinders, the cut-off being gradually increased in the former to 62 per cent. As a result the speed, instead of falling, rose to 67¾ m.p.h., and on the last kilometre fully uphill at 1 in 200 the speed was 66½ m.p.h. The 12½ miles of the ascent occupied 11 min. 37·6 sec., equivalent to an average rate of 64·1 m.p.h. On Gannes bank this performance was repeated, the speed increasing from 64 m.p.h. at the commencement to a sustained 69 up the last 3 kilometres, the average of the ascent in this case being 65·8 m.p.h. Practically the full working pressure was



Photo] [*E. A. Gurney Smith.*

GREAT WESTERN RAILWAY.

Weymouth train approaching Maiden Newton.
4-4-0 engine, No. 3452, *Penguin*, "Bulldog" class.

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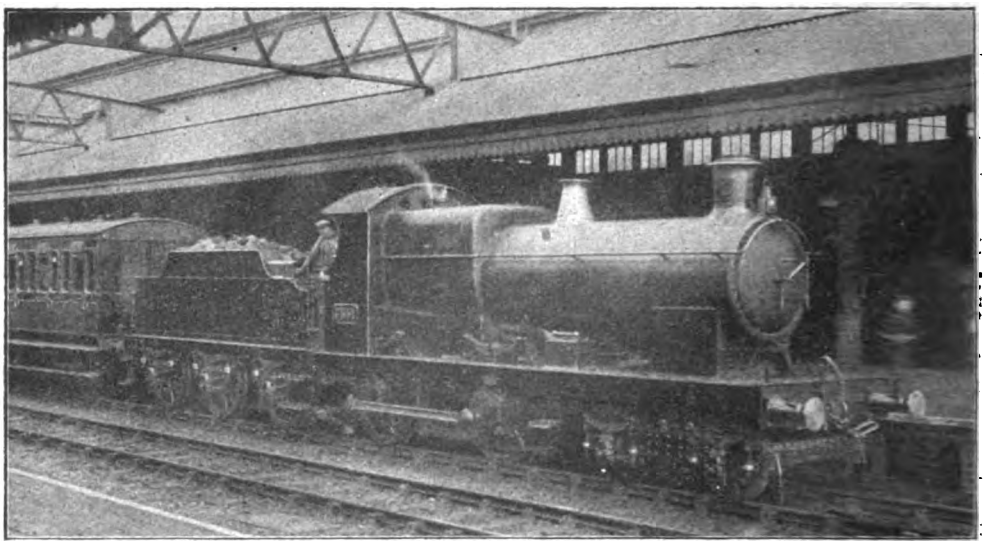
maintained on both inclines, the pressure in the L.P. receiver rising to a maximum of about 56 lbs. per sq. in.; the temperature of superheat averaged 6·45 deg. Fahrenheit. Various other instances are cited of work but little less meritorious.

The ascents of Caffiers bank were recorded on two other occasions. Engine No. 3.1154, with 296 tons, began the ascent at 70 m.p.h., and the 10 kilometres (6¼ miles) from post 268 were run in 6 min. 35 sec., which gives an average speed of 56½ m.p.h. The last kilometre wholly on the 1 in 125 gradient was run at 53¾ m.p.h. A finer performance was recorded with No. 3.1157, which, beginning the ascent at about 75 m.p.h., quoted are proportionately very much faster still than rendered necessary by any bookings of the latter Company. But when last coming out of Paris on the Nord by the 8.25 a.m. Boulogne boat train, in the autumn of 1913, I secured a record behind one of the "Pacifics" with a much heavier load of 405 tons, which fully bears out their capabilities, and illustrates their ordinary work when the driver is unaware that any record is being taken.

This run was fully described in the RAILWAY MAGAZINE for January, 1914, but its principal feature may again be mentioned. Up Survilliers bank the speed varied mainly from 56¼ to 57¾ m.p.h., and



Photo] [*Frank Roberts.*

GREAT WESTERN RAILWAY.

4-4-0 tender locomotive (converted from tank engine), No. 3551, at North Road station, Plymouth.

covered the same stretch with 287 tons in 6 min. 9⅕ sec. (average over 60 m.p.h.), the final kilometre in this case being run at 56½ m.p.h. In both these cases, although the reversing gear was in practically full gear for both H.P. and L.P. cylinders, no difficulty was experienced in maintaining the full boiler pressure.

Now there is little doubt that these magnificent performances, even though in the course of ordinary work, were stimulated by the presence of an observer on the footplate, as they represent harder running than was required even by the very fast pre-war schedules of the Nord Company. The Paris, Lyons and Mediterranean test figures never went below an absolute minimum of 54 m.p.h. Indeed, the average speed from Pierrefitte to Louvres, comprising the middle section of 8½ miles of the ascent, works out at 56·2 m.p.h., and Survilliers, 18½ miles from Paris, was passed in 21¾ min. exactly. Unfortunately the running on the ascent to Gannes was spoiled by a bad permanent way check before Clermont (although even then the 8¾ miles from Clermont to St. Just—the steepest portion of the incline—only occupied 10 min. 50 sec.), while the Caffiers bank, of course, was not negotiated, as it lies beyond Boulogne. It is worth noting that, despite two bad permanent way checks, the slack at Creil

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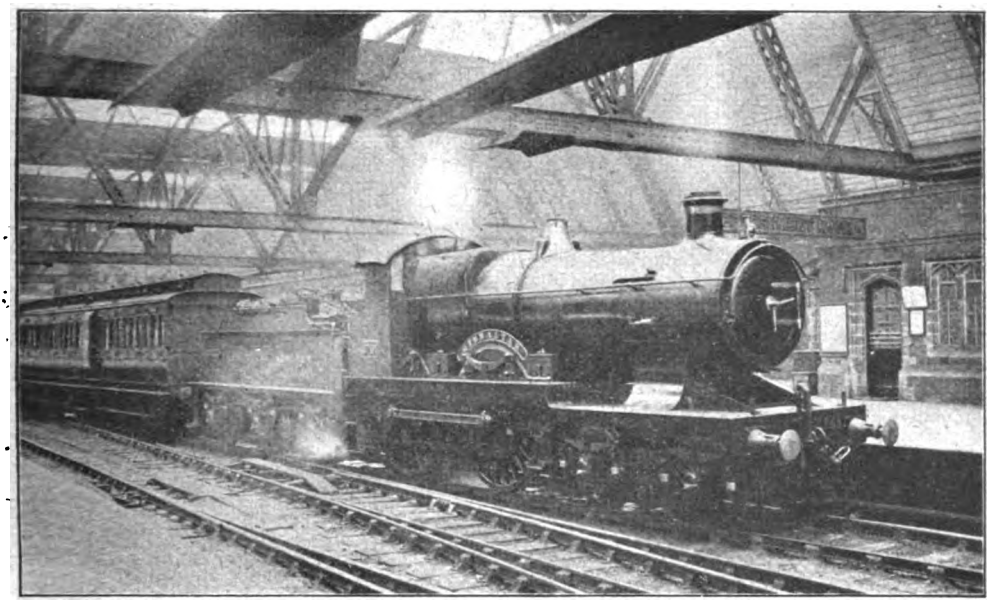
and the dead slow through Amiens, and the two long ascents—one of 12 miles to Survilliers and the other of 24 miles practically unbroken to Gannes—we covered the 109½ miles from Paris to Abbeville stop in 113 min. 50 sec.

The 31¾ miles from Abbeville to a signal stop at Etaples took 34 min. 10 sec., with an average rate of progression on the level, here and previously, of 69 m.p.h. From Etaples to Boulogne (Ville) we covered the 16¾ miles in 19½ min. exactly, by dint of a magnificent start up the Dannes-Camiers bank, whereby the summit, 6¾ miles, was passed in 9 min. 40 sec., despite 3 concluding miles at 1 in 130. For the full journey of 158 miles the actual running time was 167½ min., including all delays and the time lost in starting and stopping twice. Allowing the Abbeville stop, where water is taken and the train examined, and which lasted 3 min. 35 sec., our net time excluding delays from Paris to Boulogne was 163½ min., or 6½ min. under that scheduled, while the net running time was under 160 min. That is to say, a mile-a-minute average speed had been maintained throughout over this difficult road with a train of 405 tons behind the tender.

Now, in order to compare with this some of the best work on the part of a non-compound engine that could be adduced, I cannot do better than describe some runs timed on the Great Western Railway during the course of last year by a correspondent whose logs have often appeared in these pages, and the accuracy and care of whose observations is without question. Two of these runs were made on the 3-hour service between London and Exeter, *viâ* Westbury, 173¾ miles, and the other three on the 2-hour Bristol service, the up journey being made *viâ* Badminton, 117½ miles, and the two down trips by the 11.5 a.m. *ex*-Paddington, *viâ* Bath, 118½ miles, which I will describe first.



Photo] [*W. H. Whitworth.*

GREAT WESTERN RAILWAY.
4-4-0 locomotive, No. 3701, *Gibraltar*, "City" class, at Shrewsbury station.

On the first of these two runs the engine was none other than the renowned *Polar Star*, No. 4005, 4-cylinder 4–6–0, with a load of eleven large 8-wheelers, 358 tons empty and 380 tons with passengers and luggage. Right at the start 1¼ min. delay was occasioned by signals "on" just beyond Westbourne Park, so that the initial 9·1 miles to Southall occupied 13½ min. But shortly afterwards the mile-a-minute rate was attained and exceeded, the time to Slough, 18·4 miles, being 22 min. 24 sec.; to Maidenhead, 24·2 miles, 27 min. 34 sec.; Twyford, 31 miles, 33 min. 40 sec.; and Reading, 36 miles, 38 min. 30 sec. The speed, which had reached 67 m.p.h. at

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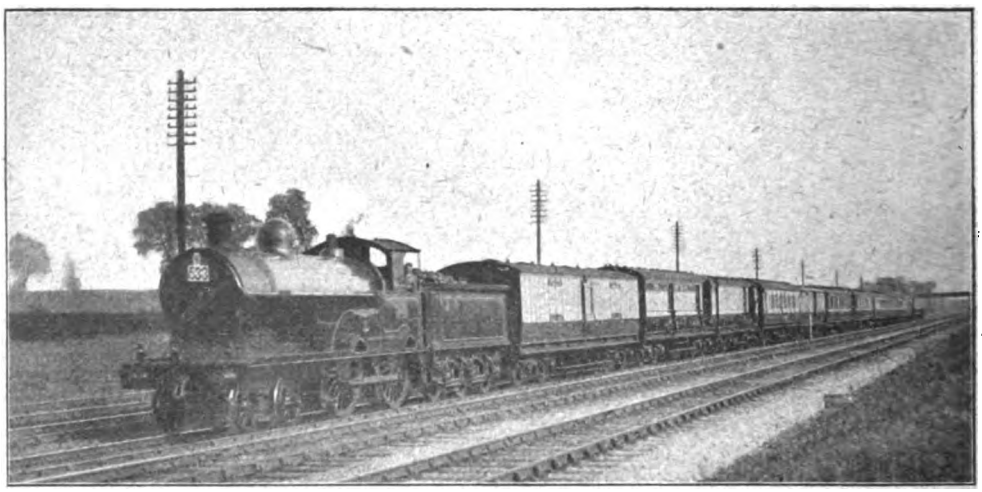
Slough, but had fallen to 65 in Sonning cutting, now rose to 70 m.p.h., and thereafter was maintained with great uniformity, the 5 miles between posts 35 and 40 taking 4 min. 20 sec., the next 5 miles 4 min. 21 sec., and the third series, between posts 45 and 50, 4 min. 22 sec. The grade here, although practically dead level, is if anything against the engine to the extent of 1 in 1,320, for the most part.. So Goring, 44·8 miles, was passed in 45 min. 43 sec., and Didcot, 53·1 miles, in 53 min. exactly—just inside "even time" and ½ min. inside schedule time, although Southall had been passed 2½ min. late.

Up the rising grades to Shrivenham, still very gradual but averaging 1 in 754, speed slowly fell to a minimum of 63 m.p.h., Wantage Road, 60·4 miles, being passed in 59 min. 38 sec.; Uffington, 66·5 miles, in 65 min. 22 sec.; and Shrivenham, 71·6 miles, in 70 min. 6 sec. Speed recovered to 64 m.p.h. before Swindon, but the train was eased through the station and yards, the time to the "Railway Town," 77·3 miles, being 75½ min., and to Wootton Bassett, 82·9 miles, 80 min. 46 sec. Down the 1½ miles at 1 in 100 to Dauntsey a maximum of 82 m.p.h. was reached, Dauntsey, 87·7 miles being passed in 84¾ min., and Chippenham, 94 miles, in 89 min. 41 sec. from the start. Still the driver's efforts were barely relaxed, and with a minimum of 61 m.p.h. at the summit of the 6¾ miles' rise at 1 in 660 to Corsham, and a top speed of 69 m.p.h. at the further end of the Box Tunnel, Box, 101·9 miles, was passed in 97 min. 4 sec., and Bath, 106·9 miles, in the remarkable time of 101 min. 53 sec. from the start, over 3 min. before time. From all the foregoing times of course, 1¼ min. should be deducted in order to arrive at the net figure, in view of the initial delay. The easiest of running on to Bristol sufficed to complete the journey of 118·4 miles. Despite another signal check in conclusion, Temple Meads was reached in 116 min. 35 sec., or 114½ min. net. On this remarkable run the 86·1 miles from Slough to Bathampton were covered in 75 min. 5 sec., at an average throughout speed of all but 70 m.p.h.—69·6, to be precise. From Slough to Bath no less than 5½ min. were gained on this "crack" schedule.



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

Down special "Irish Mail"—4-4-0 "George the Fifth" class engine.

The second run was not so noteworthy, but nevertheless was good. Again the engine was a 4-cylinder 4–6–0—No. 4013, *Knight of St. Patrick*—but the load was much lighter, totalling only 273 tons empty and 290 tons full. Even this load, however, was quite equal to those quoted by Lord Monkswell on several of his French journeys. The start, quite unchecked on this occasion, was very rapid, Southall being passed in 12 min. 11 sec.; Slough in 20½ min. (at 71 m.p.h.); Maidenhead in 25 min. 32 sec.; Twyford in 31 min. 40 sec.; and Reading in 36 min. 5 sec., or almost exactly "even time," a minute ahead of schedule. In

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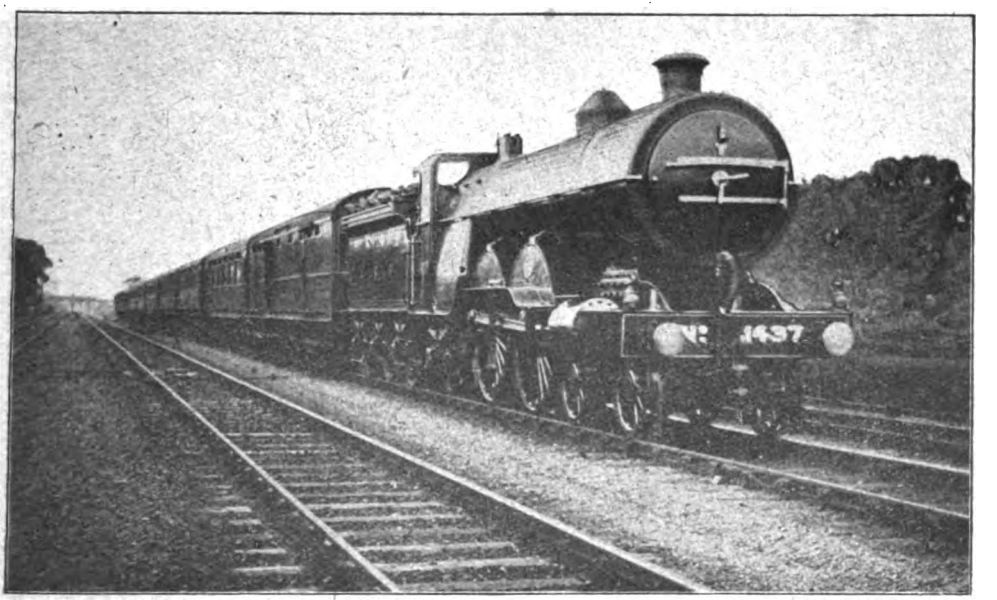
Sonning cutting the speed fell to 63 m.p.h., but through Reading the rate was 70 m.p.h. Immediately after that, however, a severe permanent way check was encountered, costing a full 3 min., so that the time to Goring was 46 min. 47 sec., and to Didcot 54 min. 20 sec. The rate had now recovered to 66 m.p.h., and after a brief fall to 63 at Challow, was again maintained at the same figure beyond Shrivenham.

Wantage Road was passed in 61 min. 15 sec.; Uffington in 67 min. 6 sec; Shrivenham in 71 min. 50 sec.; Swindon, on time, in 77 min. 10 sec., again at a moderated speed; Wootton Bassett in 82 min. 24 sec.; 113 min. from London to Bristol. If details are desired of an equally fine run with a load comparable to that of my journey out of Paris on the Nord readers should turn to the January issue of the RAILWAY MAGAZINE in the present year, where I described and tabulated a run on the same train with 420 tons behind the tender, when a speed of 69 m.p.h. was maintained easily on the level, and the net time to Bristol was 115 min. Many of the times on my journey correspond very closely with those of the run just described.

The up journey from Bristol was made on that most difficult of all the 2-hour trains



Photo] [*R. Hall.*

GREAT NORTHERN RAILWAY.

Up Newcastle to London express passing Wymondley.
"Atlantic" locomotive, No. 1437.

Dauntsey in 86 min. 27 sec.; Chippenham in 92 min. 8 sec.; Box in 99 min. 38 sec.; and Bath in 104 min. 27 sec. The maximum rates on the 1 in 100 to Dauntsey and through the Box Tunnel were 74 and 75 m.p.h. respectively, while the minimum at Corsham was exactly 60. Faster work was performed beyond Bath on this occasion, with a top speed of 69 m.p.h. at Keynsham, and, after a slight check beyond St. Anne's Park, Temple Meads station was reached in 118 min. 38 sec. from London, or 115¾ min. net. If the fastest times of these two runs are added together we get a net time of

to work—the 5.5 p.m. express, with its severe slack through Reading for the purpose of slipping a coach there, in addition to the steep initial climb out of Bristol to Filton Junction. On this occasion a 2-cylinder 4–6–0 locomotive was employed—No. 2909, *Lady of Provence*, on whose magnificent work under the charge of driver Pocock, of Bristol shed, I have had occasion to remark in these columns previously. Out of Bristol the load was 327 tons tare, or 345 tons full, reduced to 310 tons from Reading onwards.

It took 10 min. 49 sec. to cover the initial

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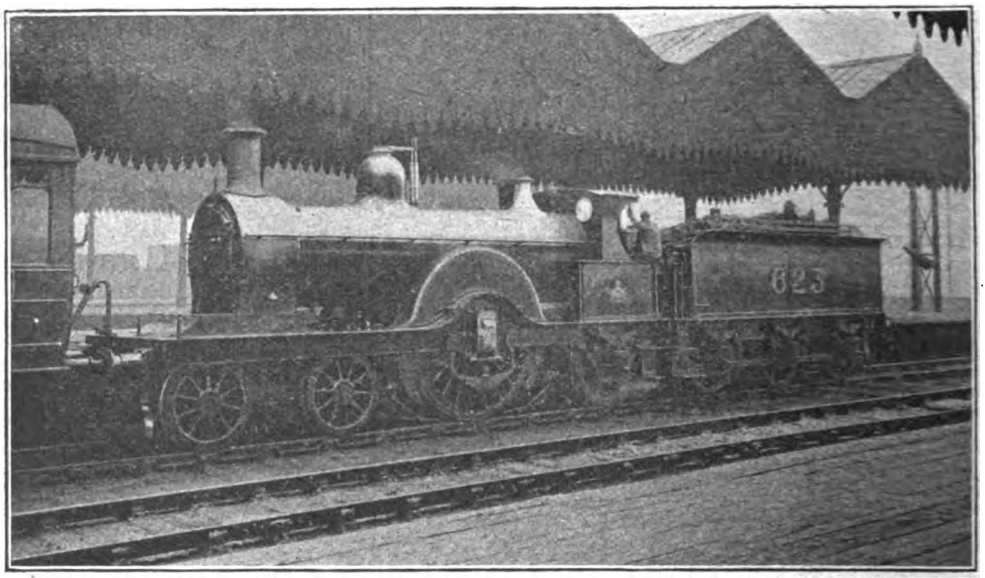
4·8 miles to Filton Junction, speed falling on the 2 miles at 1 in 75 past Ashley Hill to 21 m.p.h. But the subsequent 8·2 miles to Sodbury were covered in 10 min. 18 sec., despite a slight permanent way check, and the 4·6 miles thence to Badminton in 5 min. 21 sec., 11 continuous miles of this distance rising at 1 in 300. The total time out to Badminton, 17·6 miles, was thus 26 min. 28 sec., or 26 min. net—2 min. in excess of schedule. From there the 1 in 300 to Little Somerford was descended at a good speed, with a maximum of 77 m.p.h., the 10·3 miles between these points occupying 9 min. 18 sec., and the 6·8 miles on to Wootton Bassett 6 min. 10 sec. Slacking there as usual, No. 2909 soon regained speed, passing Swindon, 5·6 miles further, in another 5 min. 40 sec. This made 47 min. 36 sec. for the 40·3 miles from Bristol, and the train was still 2 min. behind time. But a tremendous effort was now made.

Accelerating very rapidly down the faintly falling grades from Shrivenham, Pocock worked his engine up to 77 m.p.h. at Uffington, and maintained this rate for some 10 miles, while down the concluding length of 1 in 754 to Didcot he produced the extraordinary maximum speed of 80 m.p.h. The 5·7 miles from Swindon to Shrivenham took 5 min. 11 sec.; the 11·2 miles Shrivenham to Wantage Road 9 min. 1 sec.; the 7·3 miles Wantage Road to Didcot 5 min. 35 sec.; the 8·4 miles Didcot to Goring 6 min. 44 sec.; and the 6·1 miles Goring to Tilehurst 5 min. 2 sec. That is to say, the 33 miles from Shrivenham to Tilehurst, on the whole very little easier than level, were covered in 26 min. 22 sec., at an average rate of 75·1 m.p.h.! It was, indeed, significant of the speed at which the train was travelling that nearly 4 min. were gained on schedule between Swindon and Reading alone, for which distance of 41·3 miles 38 min. are allowed. Reading, 81·6 miles from the start, was passed at 30 m.p.h. in 82 min.



Photo] [*W. H. Whitworth.*

MIDLAND RAILWAY.

Single-wheeler locomotive, No. 623, in Central station, Manchester.

Getting away again rapidly, No. 2909 covered the ensuing 5 miles to Twyford in 5 min. 50 sec. (the working time-book had the sanguine allowance of 4½ min. for this distance, but how this feat could be accomplished after duly performing the prescribed slack was wrapped in mystery), the 6·8 miles on to Maidenhead in 5 min. 59 sec., and the 5·7 miles from Maidenhead to Slough in 4 min. 44 sec. At this point, with no further assistance than 1½ miles down at 1 in 1,320—*i.e.*, on a practically level track—the speed with a 310-ton train had risen to 75 m.p.h. The 9·4 miles from Slough to Southall

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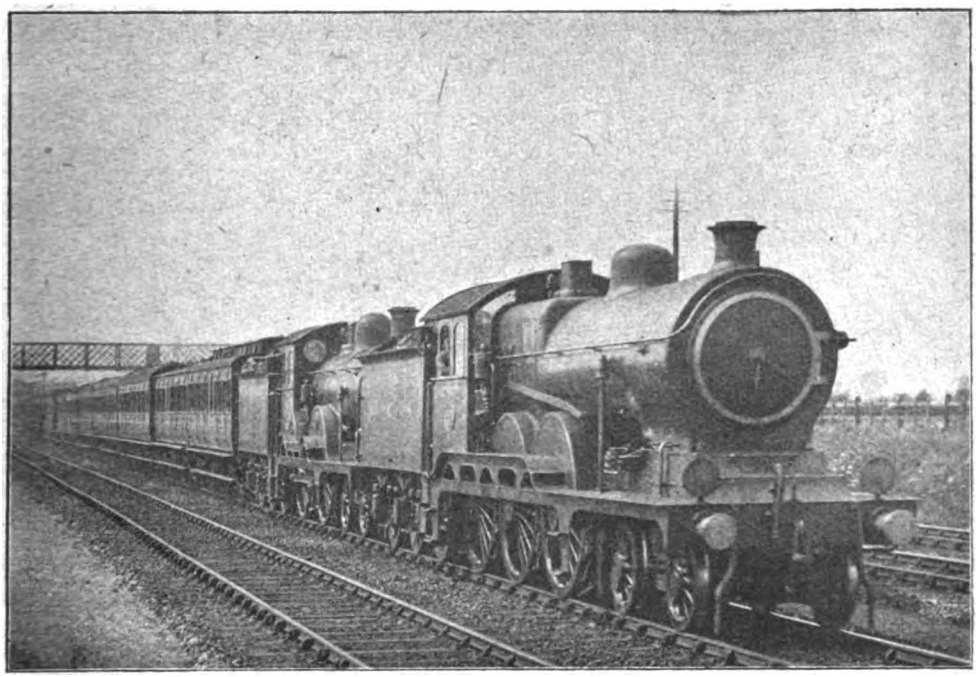
occupied 8 min. 13 sec., but by now, with time well in hand, the engine was being eased, and the final 9·1 miles into Paddington took 10 min. 13 sec., inclusive of a slight signal check at Royal Oak. Thus the total time from Bristol to Paddington, 117½ miles, was 117 min. 5 sec., or 116 min. net. Without the Reading slack this net figure would be reduced to 113½ min. As it was, the 100 miles from Badminton to Paddington were covered in 90 min. 37 sec., slacks included, but this would be reduced to a net figure of 87¾ min. by the exclusion of the delays. The 90·9 miles from Badminton to Southall took only full 485 tons; three vehicles were slipped there, leaving 373 and 395 tons respectively to go forward, and two further at Taunton, 301 and 320 tons remaining for Exeter, in the slip portion for which town my friend was travelling. A 4-cylinder 4–6–0, No. 4018, *Knight of the Grand Cross*, was the engine. Starting remarkably well, No. 4018 passed Southall in 12 min. 49 sec., and was through Langley, 16·2 miles, in 19 min. 53 sec., running at 64 m.p.h., when an exceedingly severe signal check ensued at Dolphin Box. This made the times to Slough 22 min. 41 sec.; Maidenhead 30 min.



Photo] [*F. E. Mackay.*

GREAT EASTERN RAILWAY.
Yarmouth express passing Chadwell Heath.
Locomotives Nos. 1503, 4–6–0 superheater (pilot) and 1882, 4–4–0 (train engine).

80 min. 24 sec., or about 78 min. net, exclusive of Reading slack, which represents an *average* speed of 70 m.p.h. for the whole of this distance.

From these runs I pass to two on the Cornish Riviera express, both of them exceptional in regard to the work performed, although, as far as that goes, exceptional work was necessary on these trains at any time in order to keep the bare schedules. The down express took the tremendous load of 14 vehicles, almost all 70 ft. cars and one a 12-wheeled "diner," to Westbury, weighing empty 457 tons, and 32 sec.; Twyford 37 min. 24 sec.; and Reading 42 min. 17 sec. By this time the speed of 64 m.p.h. had been regained, but the usual 40 m.p.h. slack had to be made for the diverging junction to the Westbury line. The train was now 5¼ min. behind time.

Magnificent work was performed on the rising grades which continue almost uninterruptedly from a point 3 miles beyond Reading to Savernake, a distance of 31 miles. From the regaining of speed until beyond Bedwyn the speed never varied outside the narrow limits of 53 and 58 m.p.h., and only the 2⅛ miles at 1 in 180, the ¼ at 1 in 240,

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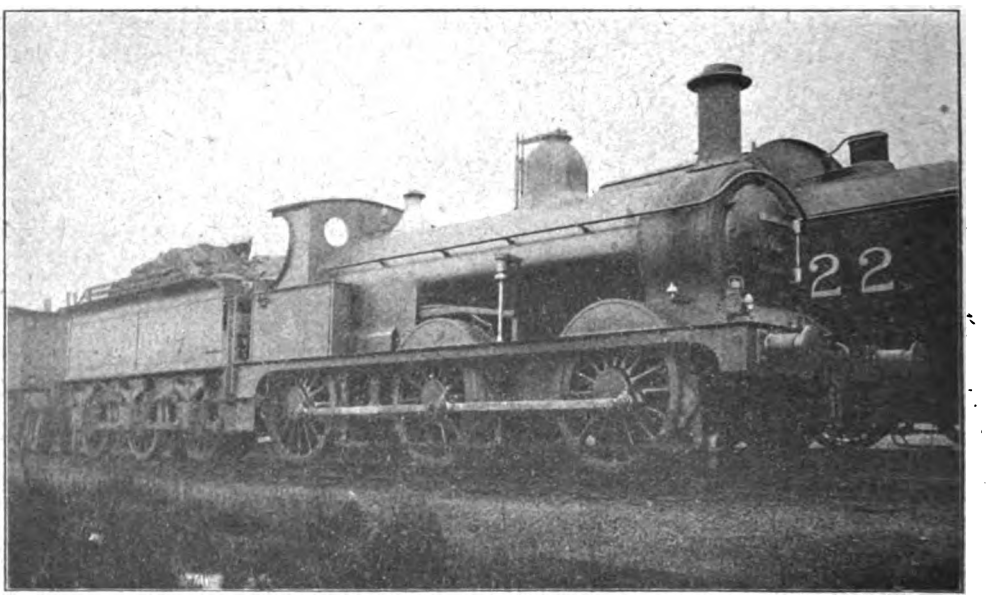
and the ⅛ at 1 in 145 which form the zenith of the climb sufficed to reduce the rate to 44 m.p.h. The 8·8 miles from Reading to Aldermaston occupied 10 min. 12 sec.; the 8·3 miles from Aldermaston to Newbury 8 min. 52 sec.; the 8·4 miles thence to Hungerford 9 min. 7 sec.; and the last 8·6 miles to the summit 9 min. 52 sec; making a total of 38 min. 3 sec. from Reading, 34·1 miles, and 80 min. 20 sec. from Paddington, 70·1 miles. Arrears of time now amounted to 6 min. 50 sec., of which 4 min. were attributable to the Slough check, and ¼ min. to a very slight signal check before Newbury. Good use was made of the long falling grades to 54 sec., and the ensuing 8·7 miles over "Mile-post 122¾" summit to Castle Cary in 8 min. 16 sec., the speed on the 1 in 81-98-93-98 descent to the latter point reaching 80 m.p.h. A very high speed was maintained over the whole of the Castle Cary-Langport "cut-off," not falling below 66 m.p.h. (at Charlton Mackrell) and varying between that rate and 78 m.p.h. at Athelney. So the 10·3 miles from Castle Cary to Somerton were covered in 8 min. 35 sec.; the 12·2 miles from Somerton to Cogload Junction in 10 min. 12 sec.; and the 5 miles thence to Taunton in 4 min. 45 sec.; making a total of 149 min. 14 sec.



Photo] [*W. H. Whitworth.*

MIDLAND RAILWAY.

0-6-0 goods locomotive, No. 3000.

Westbury, speed rising to 71 m.p.h. on the first stretch past Pewsey, falling to 66 on the slight upgrade before Woodborough, and then rising to 83 m.p.h. on the 6 miles at 1 in 222 past Lavington. So the 11 miles from Savernake to Patney were covered in 10 min. 18 sec.; the 10·3 miles from Patney to Edington in 8 min. 4 sec.; and Westbury, 95·6 miles, was passed in 102 min. 39 sec. from the start, or just under 98½ min. net.

Slacking to 30 m.p.h. at Westbury and 25 at Frome, No. 4018 negotiated the 5·7 miles between these two places (largely ascending at 1 in 151) in 7 min. 53 sec., the 5·3 ascending miles to Witham in 6 min. for the 142·9 miles from London, or 145 min. net. The train was now on time, no less than 5½ min. having been gained between Castle Cary and Taunton. From Taunton a splendid ascent of Wellington bank was made with the reduced load of 320 tons, the last 3 miles, roughly at 1 in 90, 81 and 126, occupying 77, 89 and 97 sec. respectively, with an absolute minimum of 37 m.p.h. The 10·9 miles from Taunton up to Whiteball took 12 min. 40 sec.; after that, with a top speed of 76 m.p.h., the 5 miles on to Tiverton Junction took 4 min. 39 sec.; the 7·7 miles thence to Silverton 6 min. 19 sec., and the final 7·2 miles into Exeter

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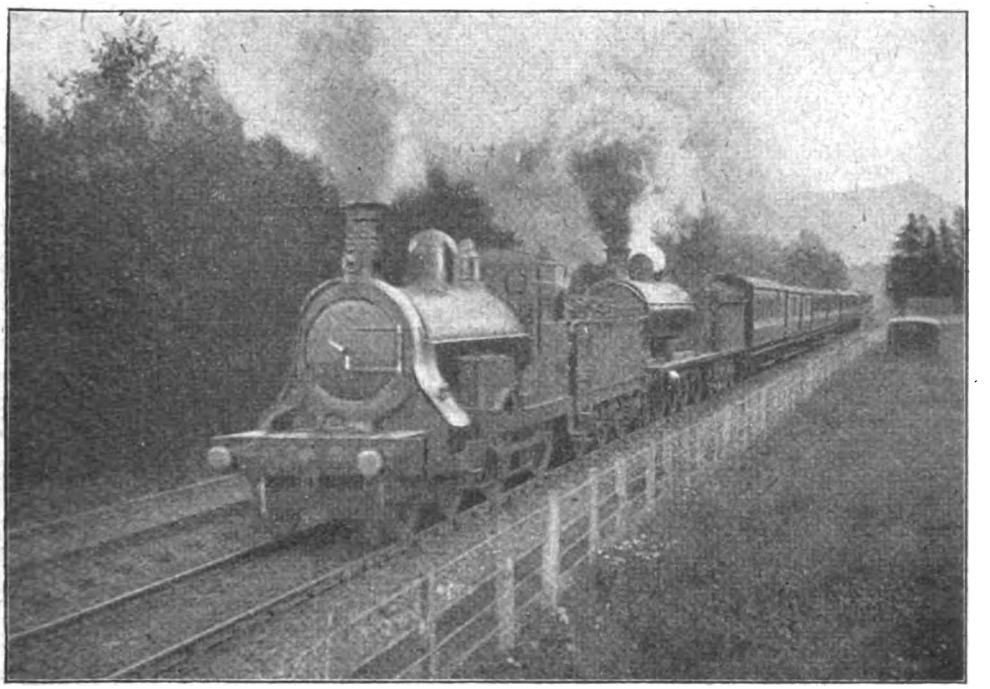
6 min. 37 sec., the slip portion coming to rest at St. David's station 31 sec. before 1.30 p.m. This gave a total time of 179 min. 29 sec. gross or 175¼ min. net for the 173·7 miles from Paddington.

On the up journey the engine was not quite so heavily loaded, although a net weight of 338 tons, or 360 tons gross, behind the tender promised No. 4035, *Queen Charlotte*—4-cylinder 4–6–0—no easy task in keeping the schedule of 3 hours to town. From the start Silverton, 7·2 miles, was passed in 10 min. 21 sec.; Tiverton Junction, m.p.h. at Somerton to 73 at Langport and 72 near Keinton, and all but 4 min. were gained in this direction also between Cogload Junction and Castle Cary, the time for this 22·6 miles being 20 min. 9 sec., and the total time for the 58·2 miles from Exeter 58 min. 11 sec. The ascent to mile-post 122¾ is one of 9½ miles, broken at various points with short strips of level, but having near the summit ⅞-mile at 1 in 98, 1⅛-miles at 1 in 93–140, ¾-mile at 1 in 98, and ½-mile at 1 in 81; on this the minimum speed was as high as 46 m.p.h. An acceleration to



Photo] [*K. A. C. R. Nunn.*

HIGHLAND RAILWAY.

Perth–Inverness special express ascending Struan bank.
4–4–0 pilot, No. 91, *Strathspey*, and 4–6–0 train engine No. 30, *Dunvegan Castle*.

14·9 miles, in 18 min. 32 sec.; and Whiteball summit, 19·9 miles, in 25 min. 2 sec. The grade is practically all adverse, although on one short easy stretch beyond Hele the mile-a-minute rate was just reached; the minimum on the 2 miles at 1 in 115 to the summit was 43 m.p.h. Descending Wellington bank a maximum of 83 m.p.h. was reached, Taunton, 30·8 miles, being passed in 33 min. 46 sec., and Cogload Junction (at a reduced speed of 60 m.p.h.), 35·8 miles, in 38 min. 2 sec. Once again the new line was taken at high speed, varying from 62 72 m.p.h. was registered before Frome, but the slacks here and at Westbury were much exaggerated, to the extent of 15 m.p.h. at the former place and 20 at the latter. So the 14 miles from Castle Cary to Frome took 14 min. 55 sec., and the 5·7 miles thence to Westbury 7 min. 31 sec. The total time for the 78·1 miles from Exeter was 80 min. 37 sec., or nearly 3 min. inside schedule.

From Westbury to Savernake some of the finest work of the journey was performed. On the 8 miles of level or slightly rising grades to Lavington speed rose to

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68 m.p.h.; the 5¾ miles at 1 in 222 up to Patney reduced it to 56 m.p.h.; on the 6 ensuing miles of level or up-grade, with its concluding 1½ miles' fall at 1 in 380–300, a maximum of 67 m.p.h. was reached; and then the final 5 miles' ascent to Savernake, beginning with 2 miles at 1 in 225–200–270, and ending with 1¾ miles at 1 in 240 and ¾ at 1 in 153, was actually breasted with a minimum rate of exactly 60 m.p.h. In recovering speed from Westbury the 4·2 miles to Edington took 5 min. 46 sec., but the 4·5 miles from Edington to Lavington were covered in 4 min. 11 sec.; the 5·8 miles from Lavington up to Patney in 5 min. 53 sec.; 17 miles from Savernake to Newbury took 16 min. 27 sec. (inclusive of a slight signal check before Bedwyn), the 17·1 miles thence to Reading (where the usual slack was made), 17 min. 10 sec.; the 17·5 miles from Reading to Slough also 17 min. 10 sec.; and the last 18·5 miles into Paddington 21 min. 1 sec. The total time for the 173·7 miles from Exeter was thus 178¾ min., and the net time 178 min., but as my correspondent remarks, with even normal running from Savernake this could have been cut to 171 min., and with the continuance of an effort comparable to that from Exeter to Savernake, to a figure even below this.

GREAT NORTHERN RAILWAY.
Up express approaching Sandy. 2-6-0 engine No. 1649 (large-boilered series).

the similar distance from Patney to Pewsey in 5½ min.; and the 5·2 miles from Pewsey up to Savernake in 5 min. dead. That is to say, the 25·5 miles from Westbury to Savernake were covered in 26 min. 20 sec., but of this distance the actual ascent, practically continuous, of 16·8 miles from Lavington to Savernake was reeled off in 16 min. 23 sec., at an average rate of over 60 m.p.h.! With 70 miles of easy grades from Savernake on to town, and over 73 min. in which to cover them, it is not surprising that the engine was now eased materially, and the run had little further interest. The

Considerations of space forbid me to enlarge upon these wonderful examples of British locomotive work at the present stage, or to carry any further the comparison of the work of compound as compared with that of non-compound locomotives than is afforded by the giving of these bare particulars. But I shall hope to have more to say on the subject in the next issue, and to go into the comparison in an altogether more detailed way, in order that the points raised in the letter with which the article commenced may receive the attention that they deserve.

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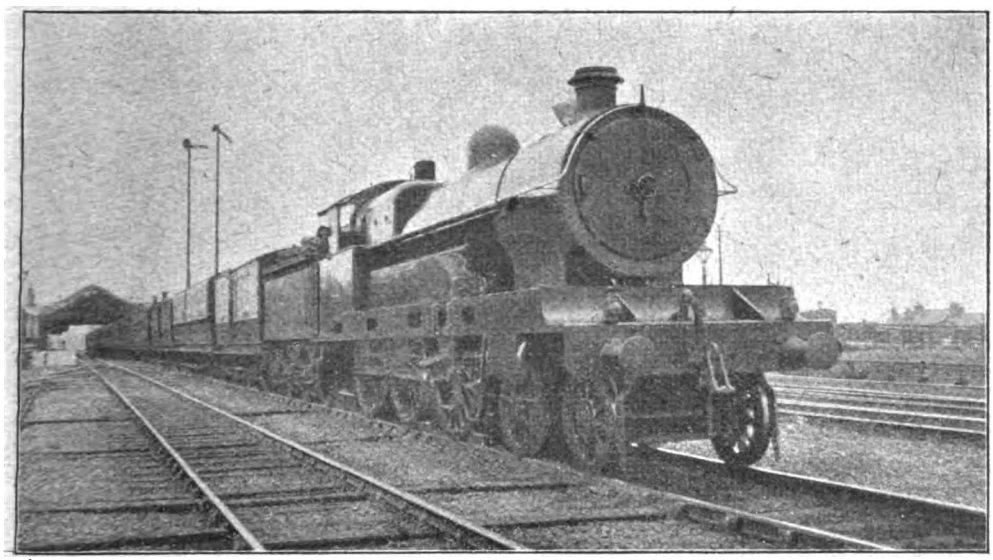
"Claughton" Class Locomotives, London and North Western Railway.

OUR frontispiece this month represents one of the latest London and North Western 4–6–0 four-cylinder locomotives of the "Claughton" class—No. 2204, *Sir Herbert Walker, K.C.B.* Such an event as the naming of a locomotive of one company after a leading official of another must, we imagine, be a very rare event in railway annals. But no one better deserves the honour than does Sir Herbert Walker, whose indefatigable labours as Acting Chairman of the Railway Executive Committee since the commencement of the War are by now well-known, in addition to his responsibilities as General Manager of the London and South Western Railway.

This engine is, of course, but one of a number of London and North Western locomotives both of this and of the smaller "Prince of Wales" 4–6–0 classes that have received the names of War celebrities. The building of a series of fifty of "Claughton" class engines clearly indicates the success of Mr. Bowen Cooke's design, the only variation from the original series being in the reduction of the diameter of the cylinders from 16 in. to 15¾ in. These engines have some remarkable runs to their credit, such as from Euston to Crewe, 158 miles, in 159 min., inclusive of three slacks and one dead stand, or 152½ min. net, with a load of no less than 435 tons behind the tender. On this journey the mean indicated horse-power was 1,358, and the maximum 1,617, while the mean pull at the engine drawbar was one of 855 horse-power. Many other such runs might be quoted.

Our Crewe correspondent has compiled a list of the 50 engines forming the four-cylinder "Claughton" class of locomotives, with particulars of their stations in September, 1917.



LONDON AND NORTH WESTERN RAILWAY.

"Claughton" class locomotive, No. 2204, *Sir Herbert Walker, K.C.B.*
The photograph here reproduced shows the subject of this month's frontispiece plate at work on the up mail train due at Euston terminus 4.20 p.m. The photograph was taken at Bletchley, August 16th, 1917, when the train had to draw up twice to allow all the carriages to come alongside the station platform.

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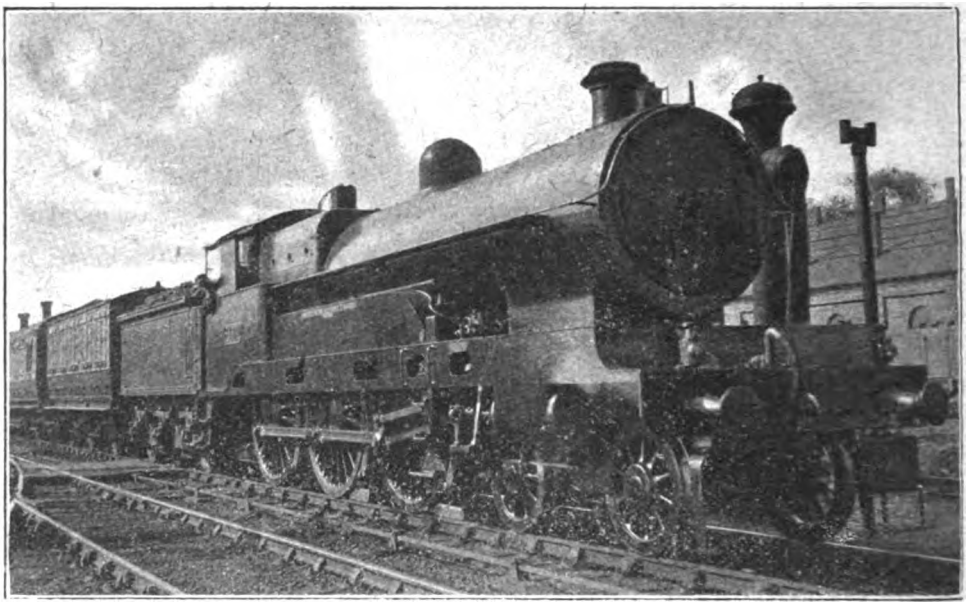

LONDON AND NORTH WESTERN RAILWAY.

"Claughton" class locomotive, No. 155, *I. T. Williams*; Driver Ashwin, Rugby. This is one of the newer engines of the "Claughton" class and it is finished "all black."

It will be noticed that 17 of them do not bear names, but these doubtless will be added to them in due course.

No. 1131, *Lord Faber*, was until recently stationed at Carlisle, and is the first locomotive of the class to be shedded at Preston.

A further ten engines of this class will shortly be put in hand at Crewe.

Locomotive shed numbers on the London and North Western Railway where "Claughton" engines are located are:—1, Camden; 8, Rugby; 15, Crewe (North); 26, Edge Hill (Liverpool); 27, Preston; 29, Carlisle.

Following is a list of the fifty locomotives before-mentioned:—

No.	Name.	Shed.
21	*Duke of Sutherland*	15
37	*G. R. Jebb*	8
154	*Captain Fryatt*	8
155	*I. T. Williams*	8
162		8
163	*Holland Hibbert*	15
186		15
209	*J. Bruce Ismay*	26
250	*J. A. Bright*	29
260	*W. E. Dorrington*	29
511	*George Macpherson*	15
650	*Lord Rathmore*	15
668	*Rupert Guinness*	15
695	*Sir Arthur Lawley*	15
713		26
856	*E. Tootal Broadhurst*	15
968	*Lord Kenyon*	15
1019		15
1093	*Guy Calthrop*	8
1131	*Lord Faber*	27
1159	*Ralph Brocklebank*	15
1161	*Sir Robert Turnbull*	1
1191	*Sir Frank Ree*	1
1319	*Sir Frederick Harrison*	15
1327	*Alfred Fletcher*	26
1334		15
1335		15
1345	*James Bishop*	15
1429	*Colonel Lockwood*	15
1567	*Charles J. Cropper*	29
2042		15
2046	*Charles N. Lawrence*	15
2097		8
2174	*E. C. Trench*	15
2204	*Sir Herbert Walker, K.C.B.*	8
2221	*Sir Francis Dent*	15
2222	*Sir Gilbert Claughton*	15
2230		8
2239	*Frederick Baynes*	15
2338	*Charles H. Dent*	1
2366		15
2373		15
2395	*J. A. F. Aspinall*	1
2401	*Lord Kitchener*	15
2411		1
2420		29
2427		29
2431		*
2445		*
2450		*

* Not in service at the time of going to press

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An Up-to-date Irish Train.

A FINE RUN FROM DUBLIN TO BELFAST.

By W. H. F. PATTERSON.

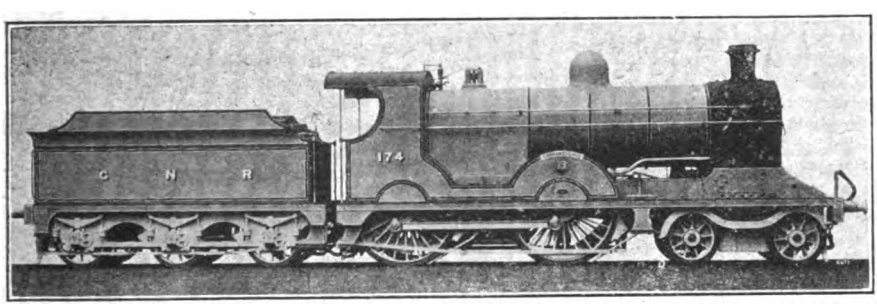
SOMEWHAT peculiar and distinctly cheering is the history of the 6.30 p.m. Great Northern Railway dining-car express from Dublin to Belfast, when compared with the deceleration and cutting down of services so general elsewhere.

For years the time of departure from Amiens Street was 5.30 p.m. (still longer ago, I believe, 5 p.m.), the hour of arrival in Belfast being always 9 p.m. It was considered a fast train even then, with its seven stops, and it always kept good time. A punctual arrival at Belfast has, indeed, always been essential as connection is advertised, though not guaranteed, to be made with the 9.30 p.m. steamer from Belfast to Ardrossan.

As the distance from railway to boat at Belfast is about a mile, it can be readily understood that in "pre-taxi" days, if the train were at all late, passengers for the steamer experienced some "nervy" moments. Five or six years ago the time of departure was altered to 5.50 p.m. in order to allow a better margin—always a rather slender one—for passengers for the north from the Holyhead steamer *viâ* Kingstown and Westland Row. The writer has twice made this connection, after delays by fog, literally "by the skin of his teeth!" It will thus be seen that the train under consideration performs the rather unique function of being an outgoing boat train from Dublin and an incoming boat train at Belfast. Recently, on Irish time being made identical with the English, the train became automatically 25 min. later, and was in fact altered to the present time of departure 6.30.

The run to be described was that of Monday, September 3rd. This express is always a full and popular one, and on this evening was crowded with delegates to the Irish Convention in Belfast. On this occasion it was composed of nine bogie carriages, including a dining car; the total weight of the train was 250¼ tons, and the length 529 ft. As mentioned later, two of the vehicles were slipped at Drogheda, and the train from there to its destination consisted of seven bogie vehicles, weighing 196 tons and measuring 412 ft. The engine was a 4-4-0 large type superheater (No. 170) and weighing with tender 82 tons 13 cwt. A sister engine, No. 174, *Carrantuohill*, is illustrated on this page.

Leaving Amiens Street punctually, we accelerated very quickly over the level stretches by Clontarf, and an exceedingly fast run was made to Drogheda, 31¾ miles, passed at 7.6 p.m. This is the first and only train not booked to stop at this important station. Two coaches for the Boyne Valley line were slipped here. Crossing the high bridge over the river, Co. Louth was entered, and a high rate of speed again attained. An excellent dinner was served on this portion of the journey, a pleasurable absence of



GREAT NORTHERN RAILWAY (IRELAND).
4-4-0 superheater locomotive, No. 174, *Carrantuohill*.

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AMIENS STREET STATION, DUBLIN.
Great Northern Railway (Ireland).

vibration being noticed, as compared with the running of many other dining cars on the Continent and elsewhere. We ran somewhat carefully into Dundalk, past the Great Northern Railway's large engineering shops —described and illustrated in the RAILWAY MAGAZINE, March, 1917—and here made our first halt of 4 min., having run 54½ miles in 62 min. Getting away at 7.36, the long ascent of some 500 ft. through the Louth and Armagh Hills was tackled in good style, Goraghwood being reached at 8.4. This is an important junction, with branches to Newry and Armagh, and the 4 min. halt made could not, I feel sure, have been improved upon. Our next stop was at the small station of Scarva, a somewhat vexatious halt, but one made in order to give a connection to the Banbridge branch. We ran over the River Bann into the large station at Portadown at 8.31, 2 min. late, and got off at 8.33.

The official timing for the run from Portadown to Belfast is 29 min. for the 25 miles, a very difficult piece of work, which includes a long rise out of Portadown, and a very cautious approach necessary for the last two miles into Belfast. There was also on this occasion a relaying slack through Lisburn. The run on this occasion was accomplished in 29 min. Our arrival in Belfast was therefore 2 min. late—an occurrence, I believe, seldom happening. This is the first occasion on which the writer had travelled by this train since its last acceleration, and he must take this opportunity of expressing his unbounded admiration of the way in which its running is managed—especially, perhaps, of the very smart use made of the almost impossibly short time-allowances allotted for the stops. It reflects the highest credit on all concerned. If there is another instance of any train in the British Isles that has been accelerated within recent years in anything like the same ratio, it would be very interesting to hear of it. I append schedule of time-table and actual running :—

		Time-table.		Actual Running.
Dublin	dep.	6.30	..	6.30
Drogheda ..	pass	7.6	..	7.6
Dundalk ..	arr.	7.33	..	7.32
,, ..	dep.	7.36	..	7.36
Goraghwood ..	arr.	8.4	..	8.4
,, ..	dep.	8.6	..	8.8
Scarva	arr.	8.17	..	8.19
,, ...	dep.	8.18	..	8.20
Portadown ..	arr.	8.29	..	8.31
,, ..	dep.	8.31	..	8.33
Belfast ..	arr.	9.0	..	9.2

Total length of run—112½ miles.

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British Railway Service and the War. [XVIII.]

IN civil, as in military walks of life, railway officers and railway men of the rank and file have been well to the fore since those anxious early war-days in 1914, when it became apparent that men who can plan, organise and work, and not those merely capable of talking, are of prime importance to a nation with a will to win. Recently the Chancellor of the Exchequer — the Right Hon. A. Bonar Law—announced that over thirty railway officers of district and higher rank had been taken by the British Government and placed in positions of vital national importance, although in each case the officers thus loaned were retaining their contractual relationships with their respective companies.

To the long list of railway officers, who, in addition to those absent on military duties, have been placed at the service of the nation, must now be added the name of Mr. John Wardle, Commercial Manager, Metropolitan Railway, who at the Ministry of Food under Lord Rhondda, has been appointed Director of Cold Storage and Inland Transport of Food, a post he is by his past experience well qualified to fill. Mr. Wardle is the first holder of the position of Commercial Manager to the Metropolitan Railway, which dates from September, 1913.

Photo] [*Elliott & Fry, Ltd.*

MR. JOHN WARDLE,
Commercial Manager, Metropolitan Railway,
Appointed, under Government, Director of Cold Storage and Inland Transport of Food.

Born in 1874 at Kearsley, near Manchester, Mr. Wardle spent eleven years on the Lancashire and Yorkshire Railway, passing through all departments in the Goods Manager's Office, both indoor and outdoor, eventually becoming, for four years, Secretary to the Goods Manager. In 1900 he was appointed an assistant to the Secretary of the Grand Trunk Railway of Canada, and he accompanied the President, Sir Charles Rivers Wilson, on an inspection tour through Canada and the United States; following this two years afterwards by a six months' tour to all the great American centres. On returning, Mr. Wardle contributed a series of articles to the RAILWAY MAGAZINE, and these were afterwards published in book form under the title of "A Tour over the Pioneer Railway of Canada." Four years later he was appointed London Manager of the Traffic Department of the Grand Trunk Railway and at the end of twelve months became a partner in a railway and steamship business. In 1908 Mr. Wardle accepted the position to organise and take charge of the Parcels and Goods Department of the Metropolitan Railway, which culminated in his appointment as Commercial Manager.

Since the outbreak of war Mr. Wardle has particularly concerned himself in all

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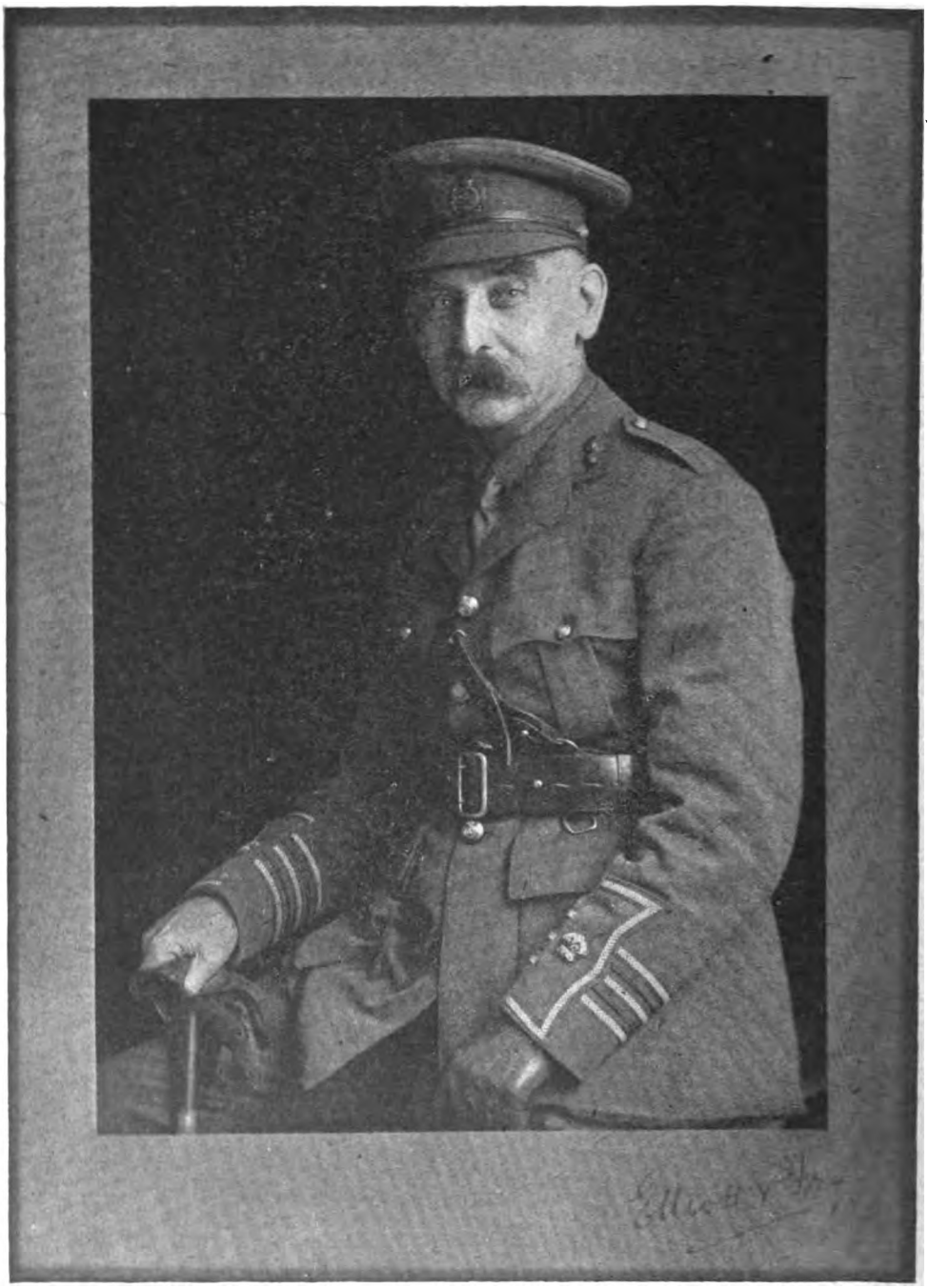

MAJOR GEO. F. P. WEST
(Royal Engineers, Territorial Force),
Superintendent of the Line,
London and South Western Railway.

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questions relating to the feeding of the people and his well-directed and patriotic efforts in connection with the cultivation of railway waste land formed the subject of an illustrated article in the RAILWAY MAGAZINE, August, 1917.

As may be expected, the proved capacity of railway officers for high positions in the national service has provoked not a little jealousy among the many disappointed office seekers, particularly those of the old-fashioned and incompetent "professional politician" type, and both in Parliament and in a section of the Press, questions have been asked, the character of which clearly denote the source of their inspiration.

"What is the meaning," recently asked the *Saturday Review*, "of this craze for railway managers? If a railway manager can manage to escape the censure of his board he will sooner or later be clutched by Mr. Lloyd George, haled before the King to be knighted —'dubb'd with unhatch'd rapier upon carpet consideration'—and placed at the head of a Government Department. Sir Eric Geddes is a railway manager, and so is Sir Guy Calthrop. The Prime Minister collects railway managers as furiously as the father of Frederick the Great collected six-feet guardsmen. As soon as the old king espied a tall man in the streets, he kidnapped him. The moment Mr. Lloyd George descries a railway manager, he knights him."

In passing it may be well to mention that up to the time of going to press with this issue of the RAILWAY MAGAZINE Mr. Guy Calthrop had not been knighted. The *Saturday Review*, however, is not alone in crediting our capable Coal Controller with the possession of a courtly title; either from misapprehension, or perhaps intelligent anticipation, it is a common error in newspaperdom.

Recently gazetted as Major in the Royal Engineers, Territorial Force, Mr. George F. West, the Superintendent of the Line, London and South Western Railway, is an officer who had valuable experience in transport matters. Born in 1866, he commenced his railway career in 1880 as Junior Clerk. In 1887 he was transferred to the Traffic Superintendent's Office at Waterloo, and after being in charge of various departments was appointed Chief Clerk in 1896. The following year he was promoted District Superintendent of the Metropolitan District, which post he held until 1902, when he was appointed Assistant Superintendent of the Line. Following the retirement of Mr. Henry Holmes, in 1916, he became Superintendent of the Line.

With respect to the work of the railwaymen at the seat of war it is perhaps impossible to improve on the summary recently given in a speech by Sir Eric Geddes, when he remarked:—"I have never admired the railwaymen of England so much as I have done in the last nine months. The railwaymen of England, helped by the Canadians, South Africans, Australians and New Zealanders, have given the Army what it hadn't got a year ago—they have given it movement. The railways now are ahead of the guns everywhere. We have got railways past the heavies, in many cases among the field guns, and in a great many cases ahead of the field guns. The ammunition wagons are off the roads—the railways do it, little railways running on a 2 ft. gauge that carry hundreds of tons a week. They are into the trenches and into the gun emplacements, they carry timbers for the gun emplacements, and those railways are saving men's lives by the thousand. But the railwaymen are paying for that with their lives. The casualties of the men who are laying and manning those railways are going up, but they are saving far, far more lives than their own casualty lists, and it is the railwaymen of England who are the backbone of that."

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper right-hand corner, and address them to the Editor. Questions relating to the names, numbers, dates, dimensions, etc., of locomotives should not be forwarded, and queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o of the Editor of the RAILWAY MAGAZINE. *Queries should not be of purely local interest. Correspondents are requested to write on one side of the paper only, and they must give their names and addresses, but a pen-name or initials may be inserted for Editorial use.*

Valve Gears.

The London and South Western Railway has no compound locomotives. We presume that you refer to the four-cylinder simple 4–2–2–0 engines designed and built by the late Mr. D. Drummond in 1898 and succeeding years. In these locomotives the valve gear of the outside cylinders, which is clearly visible, is of the Joy type, the slide-valves of the inside cylinders being operated by Stephenson link motion. As regards the Webb compounds, on the London and North Western Railway, to which you refer, only the 2–2–2–0 engines were constructed with outside Joy valve-motion, similar to the London and South Western locomotives just mentioned. This gear operated the high pressure slide-valves, the valve of the large low-pressure cylinder between the frames being worked in the majority of the three-cylinder compounds by a loose eccentric arrangement, as the low pressure cylinder was always kept in full backward or forward gear. In the 2–2–2–2 three-cylinder compounds all the three valve motions were arranged between the frames. Working drawings of these valve motions are given in Mr. C. J. Bowen-Cooke's book entitled "British Locomotives," published by Whittaker & Co. in 1893.

[Reply to JOHN W. SMITH.]

Through Running.

You are quite correct in the point you raise. The question was dealt with in a recent issue of our weekly contemporary, *The Railway Gazette*, in a paragraph so pertinent we cannot do better than quote it here :—A difference in gauge is not so great an obstacle to through running as a difference in the shape or in the size of vehicle and the shape of the load that will clear all fixed structures. The gauge of a railway is the distance between the inner faces of the rails, and means have been found to shift the wheels on the axles and so to adjust the differences. But the outside dimensions of a locomotive cannot be lessened, nor can the carriages and covered goods wagons, which are naturally designed to take the greatest advantage of the permissible clearance through fixed structures. These are the obstacles which prevent Continental and American stock running on our railways and on many Continental lines. The Continental 1·435 m. gauge is within seven hundreds of a millimetre of our 4 ft. 8½ in. gauge, so that a free interchange of traffic, as adumbrated by Sir Francis Fox in his lecture on the Channel Tunnel, could take place were it not that the Continental rolling-stock is too large and our fixed structures are too small to allow of this free interchange. There is nothing, however, to prevent our engines, carriages and goods from running on the foreign lines, and, indeed, if all future stock were built to our dimensions this same interchange would become more and more feasible in the course of time. The loading gauge even in England varies to an extraordinary extent, especially on branch and mineral lines, but the standard dimensions, as given in Molesworth, are generally, if not absolutely always, big enough for all rolling-stock; for differences from the standard sizes are in the direction of being smaller.

[Reply to A. B. COOPER.]

Tractive Effort of Compound Locomotives.

The simplest rule for calculating the tractive effort of a compound locomotive is that of von Borries :

$$T = \frac{d^2 \times P \times S}{4D}$$

where d is the diameter of the low-pressure cylinder, D the diameter of driving wheels, S the stroke and P the working pressure. Where the engine is a 4-cylinder compound, multiply the result by 2. Metric measurements can be used in calculating the effort, but the same unit must be employed in each case, *i.e.*, if the diameter of the cylinders is

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calculated in centimetres, the same unit must be used for the driving wheel diameter, and if, then, the working pressure is calculated in kilogrammes per square centimetre, the resultant tractive effort will be in kilogrammes. Similarly metric measures may be employed in Mr. Burnett's formula quoted in "British Locomotive Practice and Performance" for August, provided that the same unit is used for each different measurement.

[Reply to ANDRE SCHEFER.]

Superintendent of the Line.

There is no hard-and-fast rule as to the scope of a Superintendent's duties and authority, as almost every railway company has its own individual practice. Originally on most railways the Superintendent of the Line controlled all the operating staff, except those connected with the working of the locomotives, but the modern practice is rather to leave the building and repairing of locomotives only to the Locomotive Department, so that the whole of the operation of the railway, drivers, firemen, cleaners, etc., included, is merged into the Traffic Department, and controlled by a Chief Traffic Manager. His chief lieutenants are then a Superintendent of Operation, for operating matters, and a Commercial Superintendent, for Commercial matters. But, as we have said, the practice of almost every company is different.

[Reply to H. J. SALWEY.]

Tail Rods.

An extension of the piston rod through the front cover of the cylinder has the advantage of giving support to the piston at both ends of the cylinder. With the large cylinders at present in use, the heavy piston is thus prevented from bearing on the bottom of the cylinder, and from "squeezing out" the oil film between itself and the cylinder wall. The practice is by no means confined to the London, Brighton and South Coast Railway, but is becoming increasingly common, as, for example, in the latest 2–6–0 and 2–8–0 engines on the Great Northern Railway, the Urie 4–6–0's on the London and South Western Railway, the North British "Atlantics," all the latest Great Central Railway and Great Eastern Railway types, both tender and tank, and many other.

[Reply to CHARLES E. DEBNEY.]

Simplon Tunnel.

This tunnel, the longest in the world, is situated between the stations of Brigue, Switzerland, and Iselle, Italy, and is 12 miles 458 yards in length. It was opened in 1906 and is electrically operated by the Swiss State Railways. A little more than one half of tunnel length is situated in Italy, and while at the present is for one track, a second tunnel for another track is being made. A curious feature of its operation is a "passing place" about the middle of the tunnel, used for goods and engines only. The importance of the Tunnel and Simplon route is the easier gradients existing than on other Alpine routes. It chiefly serves the French, West-Swiss and Italian traffic.

[Reply to J. G.]

Snifter Valves.

The projection on top of the smoke-box of the new Caledonian 4–6–0 engines, behind the chimney, is a double snifter valve, which opens automatically when the regulator is closed, and admits cold air into the superheater elements, thus preventing overheating of the latter when the engine is running with steam shut off, and, consequently, without steam in the superheater tubes. Latest Great Northern Railway and Great Eastern Railway superheater locomotives are similarly equipped. These snifter valves replace the dampers previously employed for the same purpose on the superheater engines of these companies, the cylinder operating which was a prominent feature at the side of the smokebox, above the centre-line.

[Reply to M. LEWIS JONES and to W. S. UPTON.]

Steam Brakes.

Far from being "found unreliable," the steam brake is probably used more extensively in this country than any other form of brake, being fitted almost universally to goods and shunting engines which are not at any time employed on passenger duty. The reason for its removal from the London and North Western engines that you have noted, which have hitherto been fitted also with vacuum ejectors for operating the vacuum brake on passenger stock, is probably with a view to simplification of parts in order that the same system of braking may be employed on both locomotive and train, and also because the vacuum brake is held to be more rapid in action than the steam brake.

[Reply to Rev. J. A. L. ATTHILL.]

Underground Electric Railways.

A portion of the City and South London Railway was the first of the underground electric lines. It extended from a point in King William Street, near Monument station,

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to Stockwell. The Stockwell line was inaugurated by the Prince of Wales (afterwards King Edward VII.) in November, 1890, and it was opened for public traffic on December 18th, 1890.

On the Metropolitan Railway electrical working was commenced on January 1st, 1905, on the section between Baker Street, Harrow and Uxbridge. The Inner Circle section has been worked electrically since September, 1905, and the Hammersmith and City section since November, 1906.

[Reply to G. WIGGINS.]

Locomotive Exhaust.

Many factors govern the variation in the sound given out by the exhaust of different locomotive types. Principal among these are the size of the cylinder exhaust ports, as governing the rapidity with which the steam can escape from the cylinders; the size of the blast orifice, as regulating the fierceness of the blast; and the size and design of the "petticoat" under the chimney and the chimney itself. A small blast orifice makes the exhaust fierce and loud: large exhaust ports and a fairly large orifice render it sharp and staccato, as in most of the Great Western Railway locomotive types.

[Reply to A. COCKING.]

Midland Compounds.

The five compound 4–4–0 engines designed by Mr. S. W. Johnson for the Midland Railway—Nos. 1000–1004—were altered slightly in their internal arrangements to conform to the later compounds of Mr. R. M. Deeley's design, and opportunity has been taken by Mr. Henry Fowler, in rebuilding the earlier engines with superheaters, to modify the external appearance also in such a way that the whole of the compound series is now practically uniform, save that very few of the Deeley compounds have yet been superheated.

[Reply to REX LEATHLEY.]

Superheater Engines.

The provision of snifting valves, which admit cold air to the superheater tubes when steam is shut off, renders unnecessary the retention of the earlier draught retarders or dampers. On the North British engines to which you refer these snifting valves may be seen on either side of the engine at the base of the smokebox. Other expedients are also adopted to prevent the ends of the superheater tubes from burning out when steam is shut off, such as the steam jet arrangement in the Robinson superheater, etc.

[Reply to H. WARDEN.]

Midland and Great Western Railway of Ireland Engines.

It is the intention to fit all "Mecuric" and "Faugh-a-Ballagh" classes with superheaters. Of the former Nos. 124 and 125 have been superheated and of the latter Nos. 6, 7, 8 and 11. With reference to the 0–6–0 type, No. 143 has been fitted with a superheater and the remainder of the heavy goods engines will be similarly treated as they pass through the works for general repairs.

[Reply to J. MACARTNEY ROBBINS.]

Water Capacity of Tenders.

At present the largest tenders in use are those of the latest 6 ft. 4–6–0 express engines on the London and South Western Railway, which have a water capacity of 5,200 gallons, and a coal space for 7 tons. Closely approaching these are the tenders of the Caledonian 4–6–0 "Cardean" class engines, with 5,000 gallons' water capacity, and 6 tons' coal space. Both types of tender are mounted on two four-wheeled bogies. Neither line employs track water pick-up troughs.

[Reply to R. C. ENGLISH.]

Tractive Effort of Locomotives.

See reply to John R. Nicholson in the May RAILWAY MAGAZINE in respect to calculating the effort of simple engines, and reply to Andre Schefer on page 270 as regards compound engines. Results obtained in both cases are, of course, empirical, the actual performance of locomotives being governed by a multitude of considerations which could never be covered by any mere formula.

[Reply to R. W. P. HOSFORD.]

Letters on London and South Western Railway Engines.

The letters appearing on the London and South Western Railway locomotives denote the classification to enable the traffic staff to know the loads of goods trains which each engine is capable of hauling over the various gradients.

[Reply to H. W. R. SOUTHALL.]

"Claughton" Class Engines, London and North Western Railway.

The only difference between the later "Claughton" class engines of the London

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and North Western Railway and those previously built is that the cylinders have been reduced in diameter from 16 to 15¾ in.

[Reply to M. LEWIS JONES.]

Cardiff, Rhymney and Taff Vale Railways.

These railways have not amalgamated, but as a special war measure the management of all three companies has been vested in Mr. E. A. Prosser, General Manager of the Rhymney Railway.

[Reply to HENRY WOOD.]

East and West Yorkshire Union Railway.

This is a small independent mineral line near Leeds running from Stourton Junction, just south of Hunslet, Midland Railway, to Lofthouse, Great Northern Railway. It does not operate any passenger traffic.

[Reply to HENRY WOOD.]

A Tunnel Mystery.

The small tunnel alongside the Box Tunnel, Great Western Railway, is one belonging to Messrs. Yockney and Co., and leads to their quarries. It is half a mile in length, more or less. [Reply to T. A. CORBETT.]

Manchester Central Station.

Signals at Manchester (Central) are those of the Cheshire Lines Committee, which are quite distinct from the pattern standard on the Great Central Railway.

[Reply to HENRY WOOD.]

A WAR-TIME RAILWAY SCENE.

NEW ZEALAND SOLDIERS PERMANENTLY UNFIT, BEING ENTRAINED AT WALTON STATION, LONDON AND SOUTH WESTERN RAILWAY, TO RETURN TO NEW ZEALAND.

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South African Railways in 1916.

THERE is no reticence in the instructive report of Sir William Hoy, the General Manager, on the South African Railways and Harbours for the year 1916. This weighty volume, recently published in Pretoria, deals with every conceivable activity on the railways and at the harbours, while considerable space and attention is devoted to the industrial awakening of South Africa.

RAILWAY MAGAZINE readers will be particularly interested in the section of the report dealing with locomotive developments. In it Sir William remarks :—

"The further improvement of the locomotive boiler is a subject that has engaged the attention of mechanical engineers for some time. The superheater has added greatly to the steaming efficiency and has neutralized the difficulties associated with the firing of large engines to maintain the pressure of steam necessary for the work required of a modern locomotive. But increased steam pressures are still desirable, and experiments are being conducted in different parts of the world with new boiler designs and other improvements calculated to develop the steaming efficiency and the steam pressure of the locomotive. That very high pressures can be raised and maintained by means of tube or pipe generators has already been established, but it has yet to be proved whether a generator of this type can be successfully adapted to locomotive practice. A generator on these lines has been designed by Mr. F. R. Collins, Superintendent (Mechanical), Johannesburg, and inquiries are being made as to the practicability or otherwise of his proposals. The design involves a radical departure from present practice, and will require most careful investigation and consideration before further action is taken. In the experimental stage oil fuel may have to be used, but the object in view is to adapt the engine to burn coal dust, and, that being so, the result of the advance that is being made in America with engines designed to use pulverized fuel is being watched with special interest.

Locomotives designed for pulverized fuel, while producing the maximum steaming capacity, admit of the utilization of coal that would otherwise be unsuitable or unsaleable. Pulverization enables refuse grades of coal to be utilized, it eliminates smoke, cinders, sparks, and fire hazard—a most alluring prospect in a country like South Africa. A large-type locomotive equipped to burn pulverized fuel in suspension was converted by the New York Central Company in 1914. The principle has also been applied to locomotives constructed for other companies, a large engine of this type (with 63 in. driving wheels and a tractive effort of 63,000 lbs.) having been built recently for the Delaware and Hudson Company. It is said that in America the experimental stage has been passed with engines fitted for pulverized fuel, and that the principle is being extended as rapidly as the locomotives can be adapted. In addition to eliminating sparks and the liability to grass fires, these engines produce considerable economy in fuel consumption, reduce the time required to raise steam, and minimize the loss of energy which occurs while engines are standing under steam. The importance of the last-named item will be appreciated from the fact that the "stand-by" losses are computed by some American engineers at one-fourth to one-third of the total coal consumption."

Like their compeers in Europe, railway officers in South Africa have had their war-time problems to solve, but the amount of work performed on behalf of the Military Authorities in 1916 was small compared with the services rendered in 1914 and 1915.

The South African Contingents for service overseas and in East Africa (whether travelling singly or in drafts), together with their equipment, animals, guns, etc., have been conveyed free of charge. In respect of equipment, animals, and guns, free conveyance only applied to such impediments as pertained to and accompanied the units.

From October, 1916, convalescent soldiers in hospital uniform were allowed to travel free between stations serving the local hospitals and Capetown. The Administration was, however, asked to modify this concession and to restrict it to certain days of the week, as it was found that leave privileges were being abused.

At the commencement of the year the Administration was called upon to provide trains for the transport of troops, animals, supplies, etc., from the Transvaal to Durban,

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By courtesy] [*The African World.*

SIR WILLIAM W. HOY,

General Manager,

South African Railways and Harbours.

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and during the first few months of the year 133 special trains were run for this purpose, in addition to which large numbers of live stock and large quantities of supplies, etc., were conveyed by ordinary trains.

Consideration was given during the year to the arrangements to be made in connection with the return of troops from German East Africa in order to cause the least possible disorganization of other services, but as a large number of men who returned were affected by fever and had to be accommodated in hospital for an indefinite period before being sent forward by rail, the programme arranged could not be adhered to. 6,878 troops were landed at Table Bay, of whom 3,815 were conveyed, inland by rail. Those from Capetown were, for the most part, conveyed by ordinary train, only one special being run with dining-car attached. 11,721 men were landed at Durban, of whom 10,803 were sent forward by rail during December. Thirty special trains were run with these men, in addition to five specials with 650 "lying-down" cases for Pretoria. These trains consisted of specially fitted hospital vans and ordinary main line saloons, conveying approximately 130 invalids. Altogether, 52 military specials were run from Durban during the year, 43 with troops and nine with animals. In addition, six special trains were run with Imperial troops.

The movement of troops frequently synchronized with a heavy excursion traffic, and severely taxed the available coaching stock.

It was again frequently necessary throughout the year to withdraw dining-cars from ordinary services at considerable inconvenience to the travelling public, in order to provide catering arrangements for troops proceeding to Europe and East Africa, and also those returning from East Africa.

The following is a brief and much condensed summary of Sir William's long and able report of the working of the railways as a whole :—

The year was marked by an appreciable all-round increase in traffic under the principal heads, notwithstanding the adverse effect of the intense drought which was general throughout many districts of the Union, and felt with special severity in the Midland districts of the Cape, where it was followed by floods almost equally disastrous. Passenger, goods, and coal traffic all reached figures in excess of previous years, though in some cases revenue did not expand in the same ratio as the traffic, *e.g.*, in the case of passengers and live stock. The new lines recently extended into partially developed areas are gradually augmenting main line traffic.

The outstanding feature was the heavy traffic in bunker coal from the Transvaal and Natal coalfields to Durban, Capetown, and Delagoa Bay. The coal figures at each port, as well as the total coal output for the year, constitute a record. During one week-end, namely, from 3 p.m. Saturday to 8 a.m. Monday, 8,000 tons of coal were despatched from Witbank station alone. The total coal traffic handled increased by 1,326,360 tons, or 21·13 per cent., compared with the previous year. The figures recorded, high as they are, do not reflect the total traffic handled, as they do not include the large volume of traffic—passenger, live stock, and goods—carried free of charge in connection with the military operations in Europe and in German East Africa.

It will be appreciated that the year was one of exceptional pressure for the railway service. By reason of the extreme difficulty in obtaining engines, trucks, and spares from oversea, and of the fact that the staff had been depleted in practically every grade by the release of men for military service, the Administration's resources were severely taxed in handling the increased coal traffic, and especially in meeting the consistently heavy and urgent demands for coal for the bunkering of transports. Pressure was particularly acute during the coal strike in Australia.

An analysis of the year's working shows phenomenal increases in some districts owing to agricultural, mineral, and industrial expansion, while in others drought has been responsible for reduced tonnages. On the whole, however, the outlook is distinctly reassuring, and Sir William looks forward with every confidence to considerable development in local traffic and to a large increase in the export trade as soon as adequate shipping is available. In comparison with 1909—the year prior to Union—railway earnings increased by £2,801,248, or 27 per cent.; the tonnage of revenue earning goods, mineral and coal traffic by 4,483,042 tons, or 50 per cent.; and passenger traffic by 17,415,911 passenger journeys, or 61·8 per cent. Some districts of the Transvaal are developing rapidly. In places where nothing was visible two years ago but acre upon acre of bush and jungle, extensive cultivation is now proceeding for the production of wheat and mealies.

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Great Western Railway Staff Changes.

Photo [*Elliott & Fry.*

MR. J. DUNSTER.

IN the department of the Superintendent of the Line, Great Western Railway, a number of staff changes have recently been announced, and we are publishing portraits of three retiring divisional superintendents and their successors.

Mr. John Dunster, the London divisional superintendent, retires from the service after a connection extending over 46 years. He has been in charge of the London division, which covers about 300 miles of railway, since April, 1910.

Mr. Dunster joined the Great Western service in the divisional superintendent's office at Bristol, and was promoted in the following year to the office of the Superintendent of the Line, at Paddington, where he became the personal clerk of the late Mr. G. N. Tyrrell. He occupied that position until March, 1878, when he removed to the West of England, and remained there until

MR. T. H. ROBERTS.

Photo [*Elliott & Fry*

MR. W. ROWED.

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MR. H. L. WILKINSON.
London Division.

Photo] [*Elliott & Fry.*

MR. F. R. POTTER.
Plymouth Division.

MR. H. R. CAMPFIELD.
Gloucester Division.

MR. S. MORRIS.
Westbury Division.

Four Divisional Superintendents, Great Western Railway, appointed as from October 1st, 1917.

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October, 1880, at which time he was appointed chief clerk to the divisional superintendent at Paddington. He was transferred to the General Manager's office in May, 1888, and was later promoted to be chief clerk to the General Manager in November, 1891.

In November, 1898, he succeeded the late Captain Lecky as marine superintendent, which position he held until March, 1907, when he was appointed assistant to the Superintendent of the Line, and there remained until April, 1910.

Mr. T. H. Roberts, the retiring divisional superintendent of the Gloucester division, has completed 54½ years with the company. He entered the Great Western service in March, 1863, at Ruabon, where he remained until November, 1872, when he was appointed stationmaster at Marlboro'. Two years later he was given charge of Bradford-on-Avon station, and in 1877 was appointed stationmaster at Aberdare. In 1881 he removed to Pontypool Road as chief clerk to the divisional superintendent, and remained there until 1889, when he was made assistant superintendent in the Cardiff division, with offices at Tondu. In 1892 he was appointed divisional superintendent at Worcester, which position he occupied until 1900, when he was appointed to the Reading division. His appointment to the Gloucester division took place in 1905.

Mr. William Rowed, the retiring superintendent of the Plymouth division, has been there for 6½ years.

Born in Hertfordshire in 1850, after being educated at Winchester Diocesan School, he received his early initiation into business from a firm of contractors in London. His association with the Great Western Railway dates from 1871, and following four years at Swindon he was appointed to the divisional superintendent's office at Bristol in 1875, and after three years went to Hereford as relief clerk in the divisional superintendent's office. In 1881 he removed to Paddington, where he served until 1893, as chief clerk in the station superintendent's office, being promoted to station superintendent, in 1893. Ten years later the opening of the Badminton line, shortening the route to South Wales, created a new post of assistant superintendent in the Bristol division, and Mr. Rowed was selected for the position, in which also he was transferred in 1905 to Westbury, in consequence of the opening of the new Castle Cary and Langport route to the West of England. In 1908, Mr. Rowed was appointed superintendent of the Exeter division, whence he went to Plymouth in May, 1911.

Mr. Henry L. Wilkinson, who succeeds Mr. Dunster as superintendent, London division, joined the service at Bristol in 1890, and in 1896 he removed to London, where he filled several posts in the divisional superintendent's office. For some years he was a relief stationmaster, and for three years was assistant stationmaster, Paddington. In 1910 he was chief clerk to the superintendent of the Cardiff division, and returned to Paddington as Mr. Dunster's outdoor assistant in 1911. During the past six months Mr. Wilkinson has been "lent" to the Ministry of Munitions.

Mr. Frank R. Potter, who succeeds Mr. Rowed at Plymouth, entered the service in 1895 at West Drayton and Yiewsley station and was transferred in 1897 to the London divisional superintendent's office, where he was employed until 1900, when he went to Slough in order to gain further station experience. After a short period he returned to Paddington.

In 1907 he was on the staff of the Superintendent of the Line as passenger train runner, and in 1911 appointed assistant divisional superintendent at Plymouth. In 1913 he was transferred to a similar position in London. On the inauguration of the Westbury division in 1915, Mr. Potter was the first divisional superintendent.

Mr. H. R. Campfield succeeds Mr. Roberts as superintendent of the Gloucester division. He joined the service at Exeter in 1884. He was appointed senior relief stationmaster in the Swansea division in 1891, and afterwards promoted to the office of the Superintendent of the Line. He was subsequently chief clerk to the divisional superintendent at Pontypool Road, and later in a similar position at Worcester. He was afterwards assistant superintendent at Cardiff until 1914, when he was appointed assistant divisional superintendent at Bristol.

Mr. S. Morris has been appointed to the divisional superintendency at Westbury in succession to Mr. Potter, who, as before stated, has been transferred to Plymouth. His entry into the service was at Chester in 1891. The following year he was transferred to the divisional superintendent's office at Paddington. Three years later he was given a post in the General Manager's office, and in 1896 returned to the divisional superintendent's office. In 1907 he was chief clerk, and four years later indoor assistant superintendent. He was transferred to Plymouth as outdoor assistant superintendent in 1913.

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Railway and Allied Literature.

WATT AND THE STEAM AGE. By John W. Grant, C.E. 1917. [London: St. Bride's Press, Ltd., 24, Bride Lane, Fleet Street, E.C.4. 212 pages. Cloth boards, 7s. 6d. net.]

This work contains several portraits as illustrations, and it is intended to be a concise history of the art of steam navigation, mechanical and marine engineering, paddle and screw steamers, reciprocating engines, steam-turbines and electricity. In his preface the author explains that the book is designed for the benefit of young students who are studying engineering, but it will be found useful to artisans and others who take an interest in this branch of science.

James Watt was born in the year 1736 and died in 1819. His name is indelibly associated with the early history of the steam engine, and the steam indicator was one of his greatest inventions. It was Watt who originated the accepted definition of the term "horse-power," and this has remained in vogue ever since it was first applied by him. The measurement of power on this basis is only resorted to in locomotive practice when special tests are undertaken, but for every other class of engine, internal combustion as well as steam, and in the field of electricity also, the term is applied for the purpose of demonstrating the standard of power output reached.

In a chapter headed "The Locomotive," there appears a statement that "Watt took no active part in steam as a navigating or locomotive force, and although he was as bitterly opposed to the railway as he was to Henry Bell's forecast of steam propulsion—because he thought such a high pressure of steam necessary for the purpose was out of the question—he, however, produced improvements upon steam engines which, in his own words, 'are applied to give motion to wheel carriages for removing persons or goods or other matter from place to place and in which the engines themselves must be portable.' His boiler was to be of wood or thin metal, and even earthenware was used in early boilers as they never expected a pressure much above that of the atmosphere. His firebox or box was to be within the cylindrical or globular boiler. The steam was to be discharged into the atmosphere or else condensed by a curious arrangement for surface condensation."

Watt got a small model made which was remarkable for its ingenuity. William Murdoch is said to have made the first toy locomotive, whilst Henry Bell also had schemes for steam-driven carriages for railways and common roads.

Watt was a prolific inventor, and not only this, but his inventions rank as among the most epoch-making in the field of industry to which they apply. The present work, which the RAILWAY MAGAZINE can recommend to the perusal of those for whom it is specially intended, concludes with the following three short paragraphs:—

"James Watt—Greenock (1736–1819). Watt stands for 'power,' the practical unit of electrical activity or power or rate of doing work, and is the power absorbed in a circuit of one volt."

"One horse-power is equal to 746 Watts, one kiloWatt is equal to 1,000 Watts, or one kiloWatt to about 1½ h.p., 'Watt' and 'H.P.' being thus the current coins in these realms of science."

"How appropriately Watt's name is handed down to posterity by a term he so fully understood; the unit so universally known as a horse-power owes its existence to James Watt."

* * *

THE WONDER BOOK OF THE NAVY. Edited by Harry Golding. [London: Ward, Lock and Co., Ltd. Price 3s. 6d. net, or in cloth binding 5s. net.]

As a companion volume to "The Wonder Book of Railways," a wide welcome may safely be predicted for this handsome book.

Among the contributors are many well-known naval writers, and the 16 coloured plates include the work of the foremost naval painters. But perhaps the chief interest will centre in the drawings and photographs—of which there are no fewer than three hundred—depicting almost every phase of the Navy's activity, and incidentally conveying a wealth of information as to happenings in the War.

Mr. Archibald Hurd explains in his usual lucid manner, for the benefit of younger readers, "Why We Have a Navy," and in "A Chapter of History We Dare Not Forget" recalls the many occasions in the past when the Navy has saved the nation. He also writes in a chatty, informative way of "Big Guns" and of "Types of Warships and their Uses." Mr. Gerard Fiennes, whose name will also carry weight, writes of the work of "Blockade and Patrol," of "The Empire and the Navy," "Life and Routine in a Warship," "Convoys and Transports," "The United States Navy" and "The Navies of Our Allies." Among other topics that are ably handled by various well-informed writers are "Submarines," "The Naval Air Service," "Mines and Torpedoes," "The Training of Naval Officers," and "Wireless Telegraphy in the Navy." In fact, there is scarcely a question connected with the Navy which this volume will not answer, and though primarily prepared for boys and girls, it will be found, in fact, a mine of information to the middle-aged citizen.

On the artistic side the book is as remarkable as on the literary, including as it does reproductions of battle and other pictures by several famous naval painters.

An interesting "Foreword" is contributed by Captain Alan H. Burgoyne, M.P.

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PERTINENT PARAGRAPHS

Railways Under War Conditions.

A LIVERPOOL reader, who signs himself "H. S.," asks for space in the RAILWAY MAGAZINE in which to express his views on the above subject in so far as it is likely to affect railways after the war. Being a monthly periodical, the RAILWAY MAGAZINE does not lend itself to controversy in the same way as a daily or weekly newspaper, but having put forward in July one side of the case, we are pleased to fall in with our reader's suggestion that he should be allowed to present the other.

He writes :—

"In the July number of your magazine there appears a very interesting article on the changed methods of working which the war has made on British railways. Many of these changes will doubtless be retained after the war, either wholly or in part, but it is very necessary for our manufacturers and shippers to maintain a watchful and critical attitude respecting same. Some alterations, although admirable from railway companies point of view, as reducing clerical labour, book-keeping trouble, collection of accounts, and so forth, may very easily prove hampering to our trade. Everyone, I think, is agreed that in the future we shall have to meet much greater competition from other countries than we have done hitherto. This being so, our manufacturers and shippers will require every help possible to enable them to hold their own in their old markets and secure orders in new ones. I therefore venture to draw your attention to the portion of the article I mention, which touches on the railway companies now wishing all carriages to be prepaid by the senders of the goods. On parcels this would not make any difference, but on goods for export it would in many cases seriously handicap our exporting firms, particularly in the textile trade, which I scarcely need remind you is in normal times a very large and important one. In order to enable our traders to quote their foreign customers cheap, stable and comprehensive prices for manufactured goods, and thus encourage trade, our shipowners have for years past quoted 'Through Rates' of freight from the town of manufacture of the goods to the final port of destination abroad. These 'Through Rates' cover the cost of carriage from the inland town to the port of shipment here, the expenses of handling in such port of shipment and the ocean freight to the foreign port of destination. The costs of carriage and handling are borne by the shipowners. The 'Through Rates' are fixed at figures which are lower than the shippers would have to pay if they bore the cost of carriage, shipping expenses and ocean freight. In order to avail of these cheaper 'Through Rates,' the railway carriage from the inland town to port of shipment must be payable by the consignees in such shipping port, and not by the senders in the inland town. You will therefore see that if in the future the railway companies were to insist on the senders always prepaying carriages, this system of 'Through Rates' (which has been of great assistance to British traders up to now) would have to be abandoned. The introduction of this system was, I believe, made by the shipowners, chiefly in consequence of the insistent demands of manufacturers, merchants, etc., who required it to enable them to meet the competition of rivals, chiefly the Germans. The German traders had for a long time past benefited by this system, and owing to their extensive inland waterways and favourable railway facilities had developed it highly. I have heard that German merchants in normal times had no difficulty in quickly procuring a through rate from any inland town in Germany to any foreign port, thus being able to at once quote prices which, from their promptness and cheapness, secured them the orders against their foreign competitors, who did not enjoy equally favourable conditions. In the course of time we shall doubtless have to meet this competition again, but in an intensified form, owing to increased State aid, low labour costs, etc., and I fear that if any facilities which tend to cheapen transport here are withdrawn, our traders in many markets, at any rate, will be placed at a most serious disadvantage. Expansion of trade, of course, also here benefits the railway companies, and in their own interests these gentlemen would do well to carefully consult manufacturers, etc., before making permanent alterations, the ultimate effects of which may much more than nullify any supposed economies. Modern trade is of such a complex nature that ill-considered, hasty alterations may easily have disastrous consequences."

The St. John's Wood Railway.

A RAILWAY MAGAZINE reader, Mr. H. L. Cottell, long resident in the United States of America, passed his boyhood some forty years ago in the St. John's Wood district of London and well remembers the St. John's Wood Railway. His recollections he has kindly written down for the benefit of other readers, and they are as follows :—

As far as he can remember, it was originally built between Baker Street and Swiss Cottage

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only, and single line, but as the tunnels were all double-tracked at the mouths and for a few yards to allow of the connections, the casual passenger would not have perhaps noticed that it was a single line, for the stations were all double-tracked, viz., the two intervening ones, St. John's Wood Road and Marlboro' Road. One tunnel was single mouthed, viz., the one between St. John's Wood Road and Baker Street, that is at the West end only.

The two trains passed one another at St. John's Wood Road, and it is well remembered how invariably the train from Swiss Cottage nearly always kept the other train waiting a few seconds, and it was interesting to see the black-clad pilot jump from the engine of one train and quickly board that of the other to convey it in safety to Swiss Cottage. For some inexplicable reason, the rails in 1874 were entirely removed on one side of Marlboro' Road station, the left-side as one entered, and that platform closed for years until the Harrow extension was built, all three tunnels widened, which was about 1882, when Wellington Road, Finchley Road, and that portion close to Baker Street were torn up and were in chaotic condition for nearly two years. Mr. Cottell states he never understood why Marlboro' Road left-side platform was abandoned, as well as the rails removed, unless for economy or shortage of rails.

At one time in the 'seventies, there was in process of construction a single track tunnel from Swiss Cottage, parallelling the Finchley Road, reaching at its mouth a point just about where the present Metropolitan Finchley Road station now is. This work was suddenly abandoned, however, and the old tunnel mouth—never destined to be used—was for years the object of attraction to boys playing in the then fields and meadows of that vicinity.

When in about 1878 the extension from Swiss Cottage to West Hampstead was being constructed, a considerable portion of that old tunnel alluded to was entirely abandoned, and the two single track tunnels were constructed on a curve considerably to the left of the abandoned one.

The Harrow extension was completed and opened to the public on August Bank Holiday, 1881, and Mr. Cottell well remembers passing over the line on that date, through the then pastoral regions of Willesden, Kingsbury-Neasden, Preston and Harrow.

Considering the tunnels between Baker Street and Swiss Cottage were not widened until some years later, about 1883 or 1884, the trains were very admirably handled on the single track portion, and as noted, for some time with only one platform in use at Marlboro' Road.

Until the abandonment of the left platform at Marlboro' Road, about 1874, the old-fashioned signals were in use, being placed just over the arch of the tunnels, but these, with the signal box at Marlboro' Road, were abandoned at the same time as the platform was, though a signal box was always kept in operation at St. John's Wood Road.

Night Travel by Ladies on Indian Railways.

INDIAN Railway carriage departments are busy making experiments with devices for locking compartments in which ladies travel alone at night to protect them from outrages such as have happened from time to time for some years past, and a railway journalist recently had an opportunity of inspecting the devices under experiment on the East Indian and the Bengal-Nagpur Railways.

The one under experiment on the East Indian Railway is very ingenious, and has been devised by Mr. Kendrick, the Carriage and Wagon Superintendent.

Near the head of each lower side berth, at the end of the compartment farthest from the door, there is a small lever. During the daytime it is kept in a vertical position by a pin attached to a small chain. When the lady passenger retires for the night she can release the pin and the lever falls downwards. This has the effect of locking both doors in such a way that they can only be opened again by the lady herself or by two duly authorised railway officials or one railway official and a passenger.

The locking arrangement consists of a round iron rod running round three sides of the compartment at the back of the cushions. To this rod the two levers are attached. Inserted in the rod at a short distance from each door are strong round spiral springs. When the levers are in a horizontal position the springs are relaxed and the two ends of the rod project into suitable recesses in the doors. Raising the levers contracts the springs and draws the bolts from the doors, which may then be opened in the ordinary way. This mechanism is entirely inside the carriage and cannot be reached from the outside.

Should a second lady passenger desire to enter the same compartment during the night, she arouses the first occupant or summons the guard or conductor, who is provided with an ordinary carriage key which fits into a hole in the outside of the carriage at the end remote from the door. This key also draws back the bolts and unlocks the door, but only while the key is kept in position by the guard. Immediately his grip is released the bolts once more automatically shoot home, the idea being to make it impossible for a single thief to open the door, for even if he should come into possession of a carriage key, he will still be unable to open the door; as in order to keep the locking device out of action he must necessarily remain grasping the key out of reach of the door itself, unless he has an accomplice, which is not likely.

The Bengal-Nagpur Railway devices, which are being carried out under Mr. Carr, the Chief Mechanical Engineer, are also ingenious; two of them are in the nature of locking apparatus which can be operated in a simple way by the occupant of the compartment and can only be opened by the guard by means of a special key. The third, which is the invention of Mr. Morden, chief draughtsman, is connected with the vacuum brake pipe and is opened by destroying vacuum.

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American Train Speeds.

MR. EDWIN J. MILLER, hon. secretary of the Railway Club, who is contributing to this number of the RAILWAY MAGAZINE a careful analysis of non-stop railway runs in Canada and the United States of America, writes concerning the opinions expressed by Mr. William Hard in *The New York Metropolitan*, quoted in the September RAILWAY MAGAZINE. Mr. Miller remarks :—

"Your article 'An American View of British Train Speeds' makes very interesting reading, but I think Mr. William Hard has not done justice to the speeds of trains in his own country. Taking the run, New York-Philadelphia, the 'all-over' time is 2 hours, as Mr. Hard says, but that includes two or three stops. From the Pennsylvania station at New York to Manhattan Transfer (8·8 miles) the track is electrically operated, and all trains stop on the average 4 min. to change from Electric to Steam traction. The run from the Transfer station to the first (usual) stop in Philadelphia, viz., North Philadelphia, is 77·2 miles, and the speed of the best trains is 53·3 m.p.h., *i.e.*, 1 hour 27 min. *en route*. Other trains call also at West Philadelphia, making three stops to Broad Street, the terminal at Philadelphia. However, better speeds are obtained on a rival route between the two cities, the route being that of the Central of New Jersey-Philadelphia and Reading Railroads. By this route certain business trains traverse the distance in 1 hour 50 min., which *includes* a ferry journey of ¾-mile between Jersey City and New York. Other trains do the journey in 2 hours. The rail distance is 88·1 miles, and this is ordinarily accomplished in 108 min., but by the 1 hour 50 min. trains mentioned in 98 min. *En route* the best train runs a distance of 81·0 miles, from Elkins Park (Philadelphia) to Jersey City, in 80 min.—speed 60·7 m.p.h. This latter speed is of daily performance, and reflects greatly upon the railroads concerned, who (like the English) do not talk of their efficiency as the writer of the article suggests other American railroads do."

Suburban Railway Travellers Fifty Years Ago.

SUBURBAN railway travellers of to-day may occasionally possess "free-and-easy" manners, but as a class they are certainly better-behaved than their fore-runners of half-a-century ago. In August, 1867, there was at least one recorded instance of the death of a railway guard, who was struck by a bridge while he was on top of a carriage endeavouring to detect some persons who were damaging the carriages of his train. In the course of the evidence given in July, 1867, before the House of Lords' Committee on the Bill which proposed to provide means of communication between passengers and guards, Mr. Scott, the then General Manager of the London and South Western Railway, said :—"I should no more think of entrusting our suburban passengers with means of communication than I should think of flying. Scarcely a day passes that we have not several of our carriages damaged; they cut the linings and fittings, break the glasses and destroy the lamps." Mr. Fenton, the Manager of the Metropolitan line, said :—"We have to carry so many mischievous people that we are obliged to remove all the straps from the third-class carriages. We have carriages continually cut." Mr. Seymour Clarke, General Manager of the Great Northern line, said :—"These local passengers to whom no responsibility attaches are very mischievous; they have no luggage, and there is nothing by which they may be detected. You would be astonished if you knew the amount of repairs we have to do resulting from pure mischief."

Remarkable Speed in Railway Building.

HANDSOME tributes have been paid by those in high place in the British Army on the Western front to the excellent work of Canadian railway construction units. We now learn that the record for speed is held by the battalion under the command of Lieut.-Col. F. F. Clarke, formerly engineer for the Canadian Northern Railway. These are the details as conveyed by a correspondent: "We had a very difficult piece to build, because it was in full view of the German lines in daylight for a matter of one and a half miles across a valley. So, on Tuesday night, at 6.30, it started to rain and got very foggy, and we got to work, and by midnight on Wednesday we had built 12,069 feet of line and ran a train over it. When the air cleared on Thursday the Germans saw the railway track from their observation balloon and started to shell it; but after sending over about 200 shells they broke a rail, which was repaired in a few minutes. This line can only be used at night, without light or noise. We have built 22 miles of light railway and 15 miles of standard gauge, with four railway yards of about three miles of track in each. This makes about 49 miles of railway built and completed in 75 days."

Safety First.

"A GOOD idea" is the verdict in many quarters concerning the suggestion put forward in the *Great Western Railway Magazine* by Mr. Edward S. Hadley in connection with the safety First Campaign. Mr. Hadley takes as his first point the homely method employed by many to guard against forgetting an important duty, viz., tying a knot in a handkerchief. This knot, and its purpose, he proceeds to associate with the knot to be seen in sleepers and enlarging on the connection afforded by both having the same name he would have the knot in the sleeper serve the same purpose as the knot in the handkerchief. Following up the association thus formed, the article comes to the purpose it has in view, viz., that the sight of the knot in the sleeper shall be a reminder of the dangers lurking about the sleeper. By this, of course, is meant the risks of crossing or walking along the line—risks, by the way, that led to 149 servants being killed and 257 injured last year, independent of the 76 killed and 98 injured whilst working on the track. Finally, in order that the

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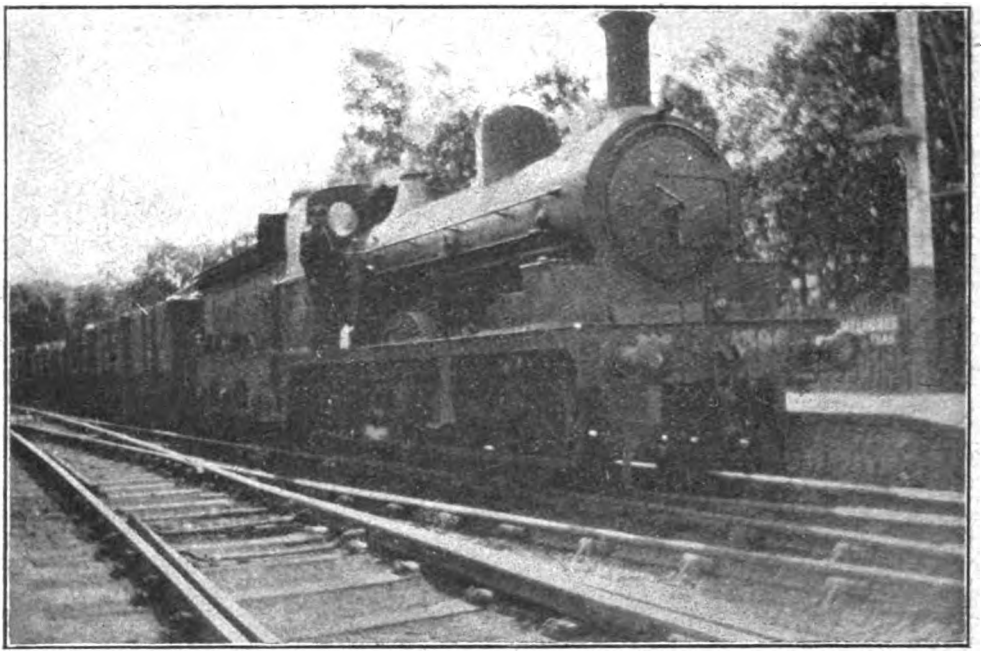

Photo] [*D. S. Purdom.*

HIGHLAND RAILWAY.

Goods train at Pitlochry, hauled by North Eastern Railway 0-6-0 locomotive No. 1396.

impression created shall become visualised and lasting, Mr. Hadley suggests that each man shall conjure up a mental scene in which he is walking alongside the line. Let him fix his mind on a knot in a sleeper and compel himself to look at it before stepping on the line. Then this knot will become his reminder to ask himself, before stepping on to the metals, "Is it safe?"

Industrial Unrest.

RAILWAYS, like other big employers of labour are not strangers to what is known as "industrial unrest." Indeed, as RAILWAY MAGAZINE readers are aware, even the war-time truce between employers and employed has not entirely kept in the background the labour troubles of our railways. On the general subject a very good article was recently contributed to a London weekly paper by Mr. F. Dudley Docker, C.B., which, after dilating on the jealousy and distrust which exists in some quarters between employers and employed, he pleads for greater co-operation between the parties as the best means of overthrowing the obstacles between them, demanding a better and more permanent understanding. "The progress of the Empire," he says, "lies in industry which is in the hands of employers and employed. We must get on with our commerce or make way for others. We do not intend to sink into a second-class community, and must prepare our own future. The first essential is to get rid of suspicion and distrust. Let there be light! The first sign is the formation of such an association as the Industrial League and the National Alliance of Employers and Employed. Here is a portent that masters and men are not afraid 'to look at' each other. Given proper organisation on both sides and representatives who feel that they are accredited, a solution will be forthcoming, provided the politicians and Government officials will leave them alone."

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At the ripe age of eighty-two years Mr. Joseph Shaw, formerly Mineral Manager of the Midland Railway, has passed away. In his early years he was connected with the general manager's department, where he attained to the position of chief clerk. Afterwards he became the manager of the Walsall and Wolverhampton Railway, and on the absorption of that line by the Midland Railway he returned to Derby, and was attached to the mineral department. The latter was originally under the goods manager, with the late Mr. William Tatlow as chief, and on its being made a separate department Mr. T. W. Hackett was appointed to the position of mineral manager. Mr. Hackett was succeeded by the late Mr. Edward Whitney (subsequently goods agent at Manchester and assistant goods manager respectively), and he in turn by Mr. Joseph Shaw, who held the post until he retired in 1902. The growth of the mineral traffic of the Midland Railway has been a prominent feature in the development of the line, and the resources of the business appear to be almost limitless. It has been perhaps the largest coal carrier into London of any of the railways and the depôts for dealing with its enormous traffic are numerous and costly. Despite his great age, Mr. Shaw was a remarkably active man, and enjoyed excellent health up to within a comparatively short time of his death. After his retirement, more than fourteen years ago, he devoted his leisure largely to travel, and has been three times round the world.

Photo [*Winter, Derby.*

THE LATE MR. JOSEPH SHAW.

* * *

An interesting function took place at St. Enoch Station Hotel, Glasgow, on September 10th, when the officers of the Glasgow and South Western Railway entertained Mr. Cooper, General Manager, on the occasion of his jubilee in the service. Mr. Robinson, Goods Manager, occupied the chair, and in appropriate terms referred to Mr. Cooper's long connection with the company. Dr. Murray, solicitor, on behalf of the subscribers, presented Mr. Cooper with a massive silver rose bowl bearing the following inscription:—"To David Cooper, Esq., J.P., General Manager, G. & S. W. Railway Co., from the Officers of the Company as a token of their respect on his completion of fifty years' continuous service with the Company. September, 1917." A portrait of Mr. Cooper and lengthy account of his career appeared in the September Railway Magazine.

* * *

At a largely attended meeting of the official staff of the Taff Vale Railway held at the head offices at Cardiff, Mr. Beasley, who a month previously retired from the position of General Manager, which he had occupied for twenty-six years, was presented with a silver rose bowl, on the pedestal of which was inscribed: "Presented' to Ammon Beasley, Esq., by the staff of the chief officers of the Taff Vale Railway as a token of their esteem on the occasion of his retirement from the position of General Manager," together with a gold-mounted malacca walking stick.

* * *

Mr. C. S. Denniss, formerly General Manager of the Cardiff Railway, and now engaged upon war work for the Government in connection with transport; and Mr. Edward Lowther, who has been General Manager of the Port Talbot Railway and Docks Company since 1902, are amongst the new Justices of the Peace for the county of Glamorgan.

* * *

Early in September the resignation was announced of Chief-Inspector Barnes, a well-known figure at Waterloo station, London. He entered the London and South Western Railway service at Andover in 1867.

* * *

To drivers of street vehicles whose records

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are free from accidents money prizes and badges of merit are to be awarded by the London Safety First Council, of which body Mr. H. E. Blain, operating manager, London Electric Railway, is one of the leading members. The "freedom from accidents" competition, as it is called, will last from October 1st, 1917, till September 30th, 1918, and will be open to drivers of motor vehicles, horsed vehicles, and tramway-cars in the Greater London area. Employers are asked to co-operate. Inquiries should be addressed to the Safety First Council, at 31, Westminster Broadway, S.W.1.

* * *

THE LATE MR. D. E. TAPPLY.
Head of the Staff and Conciliation Department, London and North Western Railway.

WE regret to record the death of Mr. David E. Tapply, which took place at his residence at Bushey on September 5th, in his 56th year. He entered the service of the London and North Western Railway just over 40 years ago in the General Manager's Office, with which department he has been connected during the whole of his career, holding several important positions, and being appointed in August, 1915, Head of the Staff and Conciliation Department, a position he filled with conspicuous ability.

* * *

AT the Railway Club, 92, Victoria Street, London, S.W., on Tuesday evening, September 11th, several members exhibited their collections of railway and locomotive photographs and postcards. All were of a very interesting character, but Mr. Miller's album of French subjects was particularly commended. On Tuesday evening, October 9th, there will be a general meeting of members at 7 p.m., and Mr. A. W. Bartlett will read a paper on the Drummond engines of the London and South Western Railway. Non-members desirous of attending should send an application with a stamped and addressed envelope to the hon. secretary.

* * *

ARRANGEMENTS have been concluded between the Government-controlled railway companies, under which a common user of ropes came into operation as from August 1st. The scheme is on similar lines to that applying to the common user of wagons, and will enable greater use to be made of the ropes and effect a saving in clerical work.

* * *

As announced in the September RAILWAY MAGAZINE, the two days' exhibition of vegetables, fruit and flowers grown by the staff of the London and South Western Railway was duly held during the first week in September at the Brunswick Railway Institute, Vauxhall. The show included 387 separate exhibits from plots within 30 miles of London. Sir William Portal, in declaring the show open, said that previous shows had been held, but this one had the official recognition of the Company, and it would not be the last of its kind. At the beginning of the year there were 5,300 allotment holders on the railway's property, and during the year 600 new ones had been added. They had been able to assist allotment holders in various ways—notably by securing seed potatoes at 6s. 10d. per bushel, as against £1, the price that was asked by the dealers, and also by supplying spraying machines and sugar beet seed free of charge. No better act of national service could be performed at the present time than the cultivation of vegetables.

* * *

THE offices of the Superheater Corporation, Ltd., having been commandeered by the Government Authorities, the company have taken temporary accommodation at 14, New Burlington Street, W.1. All communications to the company should be addressed to New Burlington Street until further notice. The company's telegraphic address is "Locosuper, 'Phone, London," and the telephone number is "Gerrard 3822."

* * *

PREMIUMS for the best kept stations are awarded annually on the North British Railway. The awards are of four classes, and in number and value are as follows:—Twenty at £4 each, 40 at £3 each, 60 at £2 each, and 80 at £1 each. The twenty stations gaining first-class premiums this year are: Abbotsford Ferry, Aberlady, Alloa, Alva, Blanefield, Broughty Ferry, Cardrona, Castlecary, Deadwater, Elie, Innerwick, Locheilside, Lyneside, Manuel, Morningside, North Berwick, St. Andrews, Saltoun, Scotstounhill, and Torrance.

* * *

A WATFORD reader, Mr. J. A. Ellis, suggests that RAILWAY MAGAZINE readers might be invited to reply to the two following questions:

(1) What is the greatest distance in Great Britain in which two single lines of normal gauge railway have the appearance of a double track?

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(2) What is the greatest distance in Great Britain where two double lines of railway (each double line belonging to a different company) have the appearance of a quadruple line?

* * *

AT the London School of Economics lectures on Railway and Cognate Subjects will commence on Thursday, October 4th, for the 1917–18 session. The inaugural lecture will be given by Sir George S. Gibb on Wednesday, October 10th, at 6.30 p.m. His subject will be "The Science of Transportation." Sir Hugh Bell, Bart., will preside and the lecture will be open to the public without fee. RAILWAY MAGAZINE readers desirous of obtaining particulars of the courses of lectures and information as to prizes, scholarships, certificates and diplomas offered by the School and the University of London should address the Secretary of the London School of Economics, Clare Market, Portugal Street, London, W.C.2.

* * *

A CURIOUS accident recently occurred on the Dublin and South Eastern Railway at Harcourt Street, Dublin. An engine with tender attached was taken to the cleaning shed overnight. Between 1 and 2 o'clock the next morning one of the cleaners, Thomas Connor, attempted to bring the engine up to a coal wagon. The engine moved rapidly over the rails, and when Connor tried to reverse it he failed. The tender struck the end of the shed, carrying it away, and, with the engine, fell into the garden of a police inspector 20 ft. below. Connor saved himself by jumping from the footplate just before the engine turned over.

* * *

ANNOUNCING an increase in underground railway fares, the London Electric Railway Company issued the following statement:—"When in January of this year the railways increased all their fares by 50 per cent., the railways in the Central London area still retained their original fares. This caused many anomalies, but it was felt that an all-round increase of 50 per cent. would be unreasonable, having regard to the largely business character of the traffic. The question of adjustment in the fares has, however, now been considered on a basis which would cause the least hardship, and on and from September 1st certain local and through fares will be revised. The revisions will affect the District, Metropolitan, London Electric, Central London, and City and South London Railways and the Great Northern and City and East London lines. No revision, however, will take place where the present 50 per cent. increase is already effective." It is stated that generally the increase will be an average under 25 per cent. of the present fares.

* * *

THE Metropolitan and Metropolitan District Railways have announced that an arrangement has been arrived at whereby passengers holding ordinary single or return tickets between certain stations on the Inner Circle will have the option of travelling to their destination by the next train going to that station, instead of being restricted, as in the past, to the particular route shown on their tickets. This will enable a passenger to use either of the two services that run in opposite directions round the Inner Circle. This facility will be of great benefit to the travelling public, as passengers between the stations where the arrangement operates will have the advantage of two train services instead of one. This will give approximately a three-minute train service instead of a six-minute service as in the past.

* * *

THERE has been put into commission from the Carriage and Wagon Department of the Midland Railway at Derby the third ambulance train supplied by that company, and it is first intended for use in France. Record time was scored in its construction, it having taken only 15 weeks to complete. It was intended to put it on exhibition, the proceeds to go to local Red Cross funds, etc., but the exigencies were such that it had to be dispatched for immediate use on the Continent. Capable of carrying 500 persons and consisting of 16 coaches, the train is 961 ft. in length, exclusive of the engine, and its weight in running order is 430 tons. The cars are mounted on four-wheeled bogies, and have semi-elliptical roofs with lofty and airy ceilings, and the gangways between the vehicles are wide enough to pass the army stretcher. Accommodation is provided as follows:—Nine ward cars (including personnel car), 36 patients each; "lying" infectious car, cots for 18 patients; "sitting-up" infectious car, 64 sitting cases and 16 "lying" cases; staff car, four medical officers and four sisters; first kitchen car, sleeping quarters for cook and accommodation for 16 "sitting" sick officers; second kitchen car, cook's quarters, and separate mess compartments for four N.C.O.'s and 12 men.

* * *

THE Midland Railway has introduced a sober war-time livery for the lorries used in its goods deliveries. The old Royal blue, with red wheels, frames and shafts, has given place to a uniform light grey, identical with the colour of its railway wagons.

* * *

IN the opinion of "T. H.," of Maryport, railway travellers in West Cumberland do not need to be at all superstitious! No fewer than three engines with the unlucky number of 13 may be seen running daily in this district, viz.:—London and North Western 0–6–2 side-tank engine No. 13, working goods and passenger trains between Whitehaven, Maryport, etc.; Furness 0–6–0 tender engine No. 13, working goods trains between Cleator Moor and Carlisle *vid* Maryport; and Maryport and Carlisle 2–4–0 tender passenger engine No. 13, which works the 5.25 p.m. passenger train from Maryport to Barrow. In addition Furness goods engine No. 113 frequently works trains between Workington and Maryport.

* * *

THE diagram of the new 4–6–0 engines for th

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London and South Western Railway—illustrated on page 196 of the September RAILWAY MAGAZINE—exhibits one or two points of similarity to current Great Western practice. Our Bath correspondent states he was informed last year when at Eastleigh that a new type was contemplated which would incorporate certain Great Western features. "If I am not mistaken," he continues, "the diagram shows a slightly coned boiler. Further points of resemblance are the curve of the frames at the leading and trailing ends, the raised side sheets of the tender (though this feature is now not peculiar to the Great Western) and the shape of the cab."

* * *

IN regard to the allusion in Mr. Cecil J. Allen's article to the exchange of 4–6–0 locomotives between the Great Western and London and North Western Railways in the summer of 1910, I believe—writes Mr. L. B. Hewitt—that the experiment was conducted on the initiative of the late Sir J. C. Inglis, then General Manager of the Great Western. As Mr. Allen recognises, the North Western engine, while the smaller of the two, was the largest express passenger type which had so far been constructed for that company. It is significant, if not positively conclusive, that the succeeding North Western design should combine the Belpaire fire-box and four cylinders, two features incorporated in the "competing" Great Western engine.

* * *

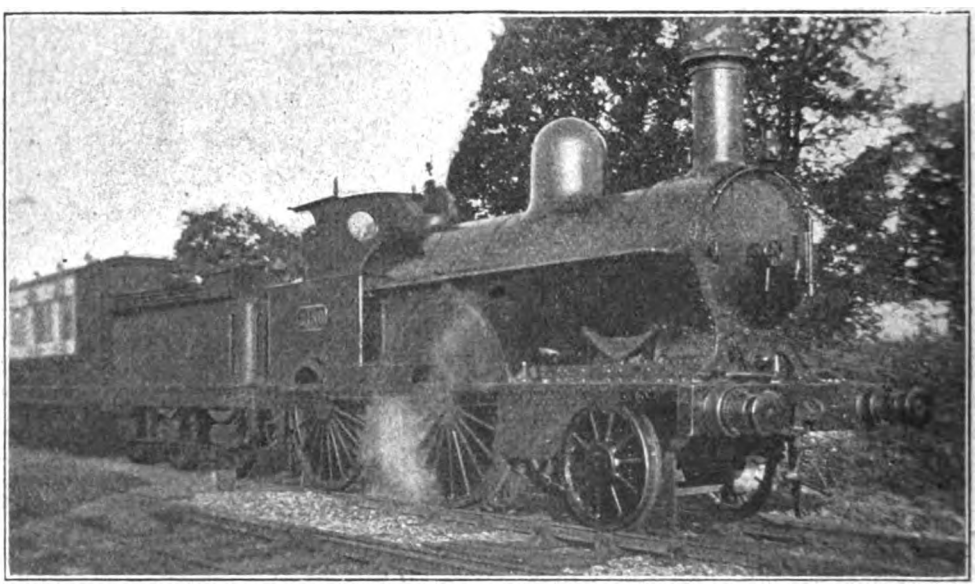
IT is quite a minor point—says the same correspondent—but I have wondered if any other reader would enquire concerning the painting of the South Eastern Railway engines under the Stirling regime. I first became acquainted with the engines of this line in 1896. All the examples I saw were painted green. The 2–4–0 Cudworth engines were a dark olive shade; and the later Stirling engines a lighter tint. There was less brass-work, and the chimneys were plainer, but otherwise the locomotives were quite as smart as Mr. Wainwright's earliest examples.

* * *

A CORRESPONDENT in the North British Railway district—Mr. W. D. M. Stephen—commenting upon a recent RAILWAY MAGAZINE paragraph announcing that the Glasgow and South Western Railway was putting more 0–6–2 tank engines into service, recalls that the North British Railway last year put six additional engines of this type into service to the same design as previous locomotives of this type, viz., cylinders 18 by 26 in., and coupled wheels 4 ft. 6 in. diameter. These were numbered 47, 54, 61, 65, 69 and 70. Six further similar engines, he says, are being put into service this year, the numbers being 142, 165, 166, 259, 276, and 453. This will bring the total number of North British Railway 0–6–2 tank engines up to 65.

* * *

RESIDENT at Kirkintillock, Mr. Albert G. Zamorski is a keen student of locomotive working in his district of Scotland. Writing to the RAILWAY MAGAZINE early in September, he remarked:—"Lately I visited Buchanan Street station, Glasgow, Caledonian Railway, and saw several 'locomotive curiosities.' The first was No. 50, *Sir James Thompson*, 4–6–0 superheater, with a workmen's train consisting of two old



Photo] [*L. R. Tomsett.*

LONDON AND NORTH WESTERN RAILWAY.

7.20 a.m. Bletchley to Cambridge train at Ridgmont. 2–4–0 locomotive, No. 2180, *Perseverance.*

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chocolate-coloured cars. Another circumstance worthy of note was a 0–6–0 goods with the Perth–Glasgow Express, while Mr. Pickersgill's new 4–6–0, No. 60, headed the Glenboig–Glasgow local. The 6.10 p.m. express, which consisted of five 38-ton twelve-wheelers, was hauled by a 4–4–0 Drummond, No. 1115, with 5 ft. 9 in. wheels! On the North British Railway I have seen the 'Atlantics' *Aberdonian*, 868; *Hazeldean*, 878; *Borderer*, 881; *Saint Mungo*, 872; *Teribus*, 906; and *Waverley*, 876; also all the 'Glehns' and several other 4–4–0 'named locos.' with a local train which is usually worked by a Yorkshire 4–4–2T, No. 131!!"

* * *

THE fortunes of North British Railway locomotive No. 224 are closely followed by a number of RAILWAY MAGAZINE readers, if one may judge by the number of replies received to Mr. Brierley's question in our September issue. Among them, Mr. D. H. Stuart writes:—

"I see a correspondent asks if No. 224 is still running. I should like to say it is, as is also its sister engine, No. 264. They are now in the duplicate list. These two locomotives were built in 1871. In 1888 No. 224 was rebuilt experimentally as a four-cylinder compound on Nisbett's system, the cylinders being arranged tandem fashion; it had Joy's valve gear. Two years later she was rebuilt in her original form with No. 264. It might be mentioned that it was only by chance that No. 224 was involved in the Tay Bridge disaster. At the time she was stationed at Dundee as a spare locomotive, and was sent out in place of one of the tank locomotives usually employed."

On the same subject, Mr. H. Warden adds the information:—"No. 224 (now 1192) is doing gular local passenger work in Fife, and was last in Cowlairs for general repair in 1915. No. 264 (now 1198) is also in Fife, and was overhauled in 1916."

Mr. W. D. M. Stephen mentions that the present No. 224 is one of Mr. W. P. Reid's 0–6–2 tank engines built in 1913; while Lieut. D. Macaulay, R.E., writing from France, gives the date of the Tay Bridge engine being re-built by Mr. Holmes as 1887.

* * *

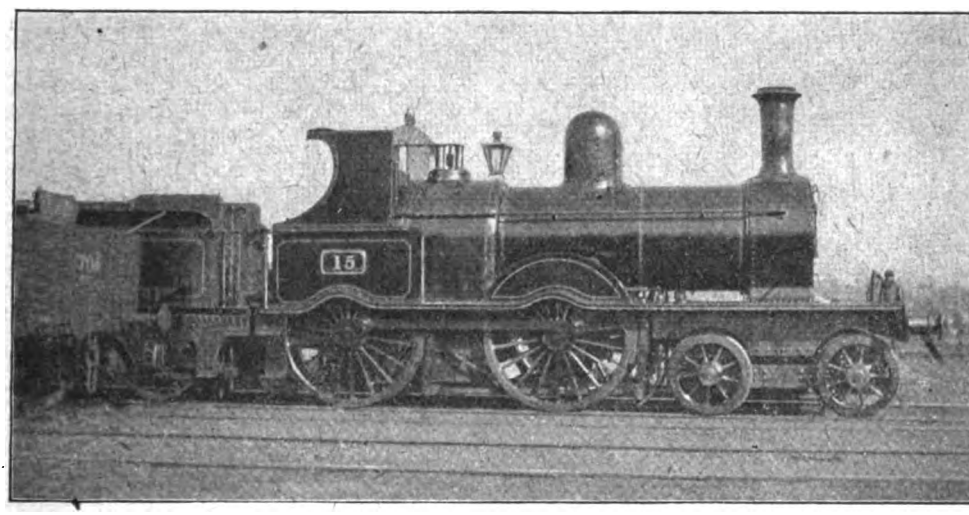
THREE Cambrian engines of the 4–4–0 type, *i.e.*, Nos. 47, 73, and 85, are now stationed at Whitchurch shed, London and North Western Railway, in place of the 6 ft. "Jumbo's," the latter having been transferred to Crewe North.

* * *

FROM Crewe Mr. Williams has written in reply to a statement made by a Liverpool correspondent in the RAILWAY MAGAZINE in June last. He remarks:—"I notice, on page 432, it is said that the first DX engine built at Crewe was No. 358, *Falstaff*, and that this engine is still running under the duplicate number 3331. As a matter of fact, No. 355, *Hardman*, was the first engine of this class, not No. 358, *Falstaff*; the latter followed No. 357, *Terrier*, and was really the third of the class to be turned out. No. 355 was never rebuilt, and was broken up in 1893."

* * *

A RAILWAY MAGAZINE reader—Mr. H. L. Cottell—long resident in the United States of America, writes that he remembers, when visiting Great Yarmouth in 1881, the Yarmouth and Stalham Light Railway had just been opened, and was then running trains to Stalham only, though shortly afterwards it was extended to North Walsham, and subsequently absorbed by the Midland and Great Northern Joint. At that



Photo] [*T. Grove White.*

GREAT SOUTHERN AND WESTERN RAILWAY.
Slow passenger engine, No. 15, at Mallow.

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time, 1881, there were, he says, some interesting types of engines, viz., *Stalham*, *North Walsham*, *Martham* and *Gt. Ormesby*, four only, he believes. When visiting England in 1909 and, incidentally, Great Yarmouth, he could find no trace of them. As far as he remembers they were all 4–4–0 tender engines. Perhaps someone can refreshen his memory and revive reminiscences?

* * *

MR. R. E. L. MAUNSELL'S South Eastern and Chatham Railway new (K class) 2–6–4 tank engine, No. 790, is at present located at Ashford (No. 6) shed. It has superheater, valve gear, 6 ft. wheels and 200 lbs. pressure. The new (N class) 2–6–0 goods engine, No. 180, is located at Tonbridge (No. 5) shed. The "K" and "N" classes of engines must not be run over the following lines:—

Charing Cross East (old four-line) Bridge.
Dartford Loop lines.
Folkestone Harbour branch.
Hythe and Sandgate branch.
Between Minster and Sandwich.
Between North Kent east junction and Charlton *viâ* Greenwich.
Rye Harbour branch.
Woodside and South Croydon Railway.
Victoria section and between
Faversham and Dover.
Chislehurst Loops and Sole Street.
Gravesend West Street branch.
Between Beckenham Junction and Norwood Junction.
Prince of Wales Pier, Dover.
Whitstable Harbour branch.
Sheppy Light Railway.
Hawkhurst branch.
Port Victoria Pier.
Tonbridge to Hastings.
Ashford to Hastings.

* * *

A NUMBER of RAILWAY MAGAZINE readers have written to report that the North Eastern Railway is painting the numbers of the engines in big figures on the tender sides after the Midland Railway practice. Mr. G. N. Peel adds the information that the North Eastern 0–6–0 goods locomotives are gradually being fitted with "Wakefield" mechanical lubricators. Another interesting point, he continues, is that the 4–6–0 locomotives are regularly running on express passenger trains, for instance, the 7.8 p.m. Newcastle–York mail train has often one of these engines on it. No. 825, the 4–6–0 engine fitted with "Stumpf" cylinders, has been at Heaton shed for a long time.

* * *

A CORRESPONDENT brings to notice that "the East Indian Railway has made a commendable arrangement for the convenience of passengers in appointing European passenger conductors with mail trains. These officials get in touch with passengers, and help them in many ways, and at the starting station hand over an extract time-table showing the departure and arrival times of trains at different stations and the refreshment room stations. The guard of the train usually has enough to do on heavy mail trains, attending to the movement of the train, reception and delivery of luggage and parcels and other matters, without having to wait upon passengers."

* * *

ROGERS PASS—the famous railway route through the Rockies to the West—is to disappear, and its place is to be taken by a prosaic but more up-to-date tunnel. Henceforth Rogers Pass, which has been operated as a railway route since 1886, will be a wagon road for tourists, the right of way having been handed over by the Canadian Pacific Railway to the Parks Department of the Dominion Government. The tracks and the snowsheds between Cambie and Stoney Creek stations—a distance of 18 miles—are to be salvaged.

* * *

THE Canadian Dominion Railway Board has decided to issue an order directing the Canadian Northern and Canadian Pacific Railway Companies to provide transfer facilities between the two railways at Rosetown, Saskatchewan. The application for the order was made by the Boards of Trade of Moose Jaw and Rosetown. The transfer will mean a saving of 41 miles both for the loaded car going out and the empty car going in.

* * *

THE Boards of the Grand Trunk Railway of Canada and the Grand Trunk Pacific Railway have appointed Mr. Howard J. Kelly president of the respective companies, to succeed Mr. Edson J. Chamberlin, who has resigned. The appointment dates as from September 1st.

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THE RAILWAY MAGAZINE.

MIDLAND GREAT WESTERN RAILWAY:

4-4-0 locomotive, No. 6, *Kylemore.*

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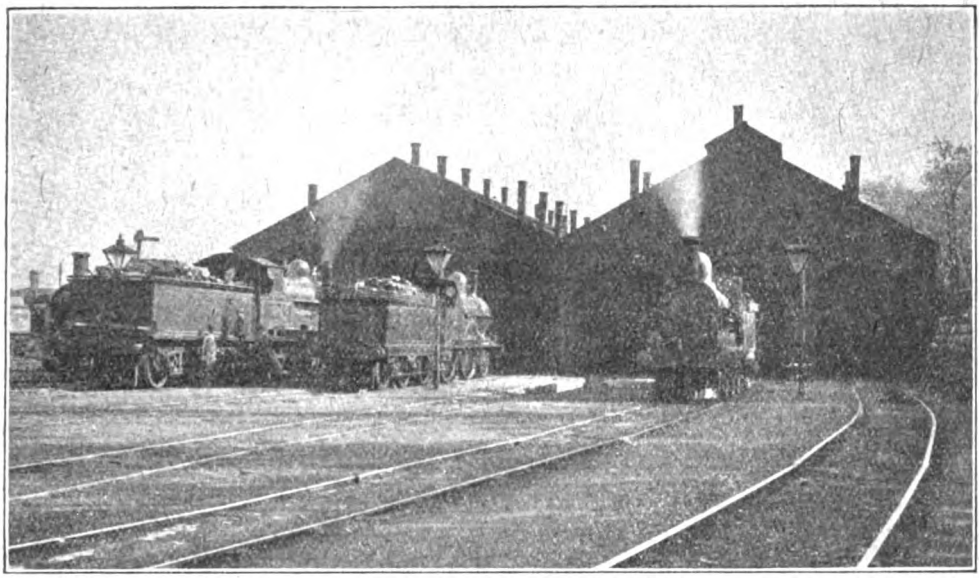

BLETCHLEY: ENTRANCE TO LOCOMOTIVE SHED, NORTH END.

The Running Shed and Locomotive Working Arrangements at Bletchley.

LONDON AND NORTH WESTERN RAILWAY.

By CHAS. S. LAKE, M.Inst.L.E.

BLETCHLEY JUNCTION, as probably most of our readers are aware, is situated on the main line of the London and North Western Railway at a distance, roughly speaking, of 47 miles from Euston. It is an important railway centre with branch lines to the East and West connecting up with other companies' main lines at no fewer than five points. On the eastern side there is the Bedford and Cambridge branch connecting with the Midland at Bedford, the Great Northern at Sandy and the Great Eastern at Cambridge, in each case with the main line systems of those Companies, and on the western the Banbury and Oxford branches which afford communication with the Metropolitan Extension line at Verney Junction and the Great Western at Oxford. The volume of through and branch line traffic dealt with at Bletchley is a very large one in normal times, the number of stopping trains being well over 100 per diem, to say nothing of the considerable number of through passenger and goods trains on the main line.

As befitting a junction of this character the locomotive working arrangements are rather more intricate than at some other stations of equal size and the number of engines stabled in the running shed is correspondingly greater. There are 36 main running sheds on the London and North Western Railway, commencing with Camden as No. 1, Willesden and Watford (combined) as No. 2, and Bletchley as No. 3, and observers will know that every London and North Western engine carries a small disc attached to the roof of the cab at the rear bearing the number of the shed at which it is stationed.

By the courtesy of Mr. C. J. Bowen Cooke, Chief Mechanical Engineer of the London and North Western Railway, the writer was recently afforded an opportunity of visiting the Bletchley running shed and obtaining the necessary information for an article thereon in the RAILWAY MAGAZINE, every assistance being kindly lent on the occasion of the visit by Mr. James Taberner, who has charge of the shed. Mr. Taberner has been in the service of the

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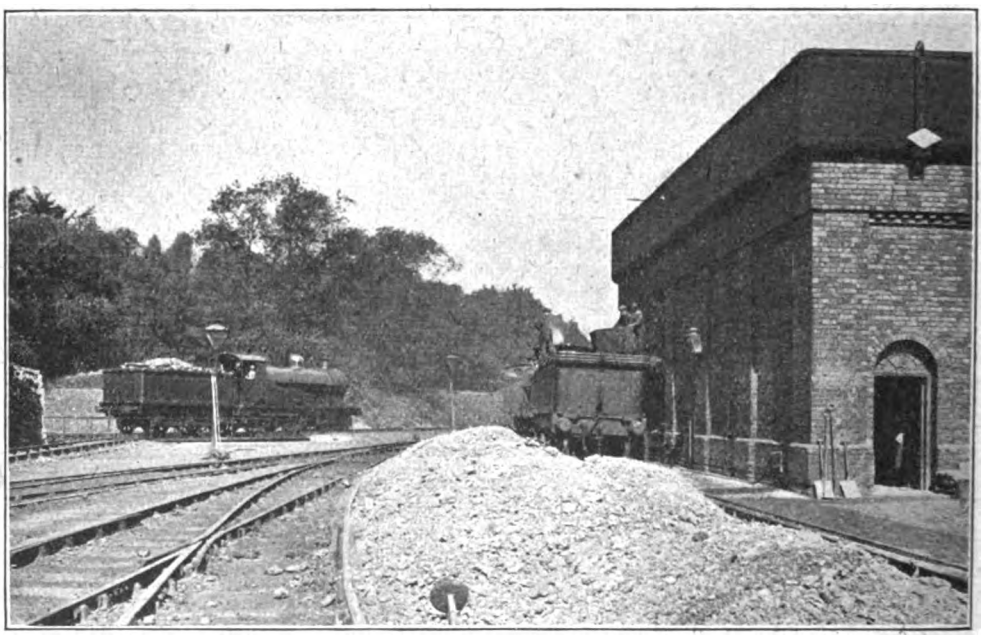
Company since 1869, a period of 48 years. He came to Bletchley in 1903 from the locomotive running shed at Ordsall Lane, Manchester, where he occupied the post of chief foreman until the shed at Ordsall Lane was dispensed with and the staff transferred to Patricroft.

Bletchley ranks as a second grade locomotive depôt, the first grade sheds being those located at larger centres, such as Camden, Crewe and so forth. The shed, as existing to-day, has a length of 250 ft. and an extreme width of 100 ft. It contains six roads and will accommodate an average of 24 tender engines or 36 tank engines according to the class and varying lengths of the locomotives. The roof is formed in two gabled spans as seen in the first of the accompanying illustrations and there are numerous chimneys or ducts for carrying off smoke. Before proceeding to describe further the shed itself it will be of interest, perhaps, to give a few particulars relative to the locomotive working arrangements as controlled from Bletchley as a centre. The district extends from a point immediately north of Tring station to a point immediately south of Roade station, and the locomotive foreman at Bletchley is responsible—as the local representative of the Chief Mechanical Engineer and acting on behalf of Mr. W. H. B. Jones, Chief of the Running Department of the London and North Western Railway—for the working arrangements on this section so far as the locomotive department is concerned. The distance controlled is 28 miles on the main line or with branches 142 miles. There are seven locomotive sheds in all on the division including those on the branch lines already mentioned and others on the Aylesbury, Dunstable, and Newport-Pagnell branches. In addition there are 9 pumping stations and one length of water troughs, the latter being situated at Castlethorpe, between Wolverton and Roade. The number of engines stationed at Bletchley is 46 and there are 14 additional ones at the out stations, bringing the total to 60 locomotives of various types. Those actually stationed in the Bletchley shed include engines of the 4–4–0 superheated, or "George V." class, also "Precursor" type engines, several 2–4–0 or "Precedent" locomotives and others of the same type but with 6 ft. instead of 6 ft. 6 in. wheels, 8-coupled goods locomotives, three of which are Webb compounds, and the others of the modern inside cylinder pattern. Some 18 in. goods engines of the 0–6–0 type, two



NORTH END OF LOCOMOTIVE YARD.

Here are located a 60,000 gallons water tank, a coaling stage, and a 50 ft. turntable.

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"Precursor" (4–4–2) tank engines, and in addition 2–4–2 and 0–6–2 type tanks.

As in the case of most locomotive sheds engines from other centres are frequently to be found in the depôt and these include at times locomotives of the "Claughton," "Prince of Wales," and other express classes so that the shed, although of relatively small size and ranking as second grade is never lacking in interest, whilst the members of the staff employed there are afforded opportunities of gaining experience in the handling and maintenance of all classes of the company's engines.

The shed is approached from the north end by a single line known as the "Loco." siding which gives access to all the main lines running through Bletchley station and yard. The running shed is located immediately adjacent to the north end of the passenger station and the offices of the foreman, Mr. Taberner, and his staff overlook the platforms at that end. All ordinary running repairs on locomotives are effected in the shed, the equipment including a blacksmith's shop with lathe and planing machine, whilst there is a drilling machine in the power house.

A 9 h.p. Crossley gas engine is used for supplying the necessary power for the machine tools, etc., and there are two sets of hydraulic pumps in this department used in connection with the hydraulic wheel drop to which reference in detail will be found below. One of the accompanying illustrations shows the wheel drop in operation, the driving wheels of a superheated 4–4–0 type engine being seen lowered from the frames and on their way down into the pit below from which they, after the engine itself has been moved out of the way, are raised to allow of access being gained to the driving boxes. This system obviates the necessity of lifting the engines bodily under the shear legs and greatly facilitates the work. The wheel drop at Bletchley is one of the latest type capable of dealing with wheels up to 7 ft. 6 in. diameter. It was installed in the year 1906 and the table is raised and lowered by hydraulic pressure

THE OLD LOCOMOTIVE TANK WITH OLD LOCOMOTIVE DEPARTMENT OFFICES BELOW.
Disused for locomotive purposes since 1877, the building is now a lodging house for enginemen and brakesmen.

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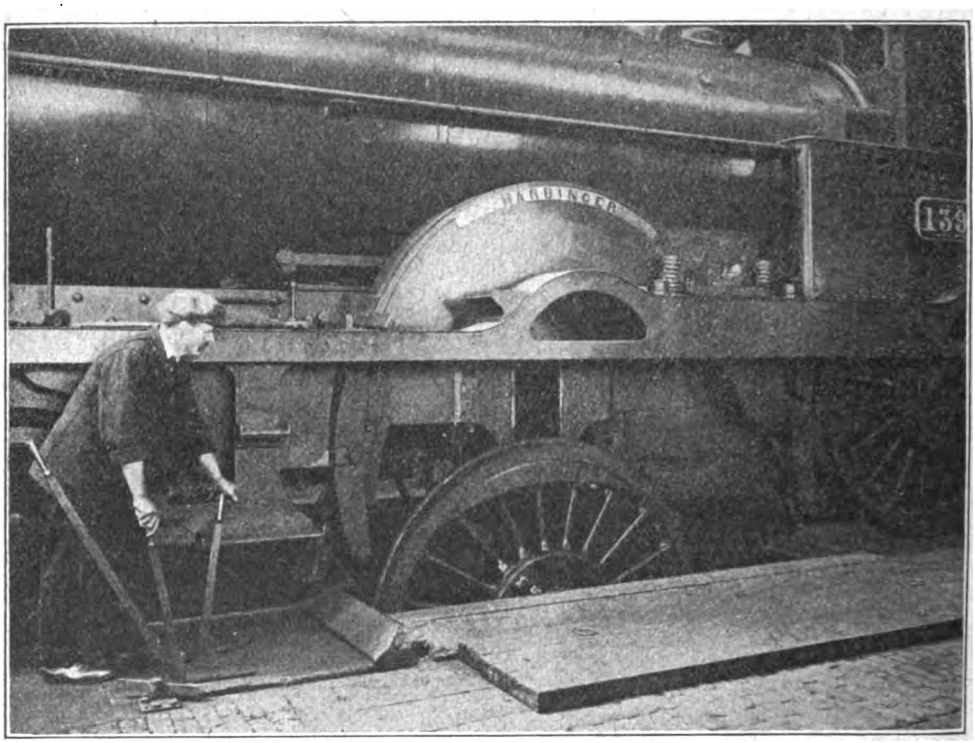
at 700 lbs. per sq. in. The table is 9 ft. long and the whole of the apparatus was made at Crewe Works. The running rails on which the locomotive is brought above the pit form part of the table, and when it is desired to drop a pair of wheels the engine is first of all brought into position and the rods removed. In the case of a driving wheel it is necessary, of course, to disconnect the connecting rods also, and in some cases the valve motion as well. There are two hydraulic valves for operating the table, one of 700 and the other of 2,000 lbs. per sq. in. These are both used for lifting, but the latter is only required for the last few inches of lift, to act on the springs to enable the axleboxes to be released from the horns. When the table has descended to a depth of 10 ft. it comes in contact with cross bars, the pressure on which pulls side rails, mounted on girders inwards to the necessary width of the track thus replacing the short section of track on which the wheels are standing and making it possible to run the engine off and out of the way so that the table with the wheels upon it can then again be raised. The 700 lbs. hydraulic valve is opened to permit of the table rising. Locking bars are brought into position to lock the table when it reaches its top position. The apparatus works very smoothly and for this class of mechanism quickly. By its aid a locomotive leading or truck wheel can be lowered from underneath an engine in 5 minutes. To lower a pair of driving wheels from an express or goods engine occupies on the average about one hour, this including uncoupling of the rods and motion parts.



LOCOMOTIVE OF "PRECURSOR" TYPE HAVING ITS DRIVING WHEELS REMOVED ON THE HYDRAULIC WHEEL DROP AT BLETCHLEY ENGINE SHED.

About 300 pairs of wheels are dealt with annually in the Bletchley shed and all movements made by the wheel drop mechanism are automatic with the exception of the manipulation of the levers controlling the hydraulic valves and locking bars. Transverse movement is effected by means of chains and balance weights, the chains running over pulleys. This movement affects the girders and side rails only, the table being capable of vertical motion alone. In addition to the wheel drop a set of hydraulic shear legs is installed in the shed

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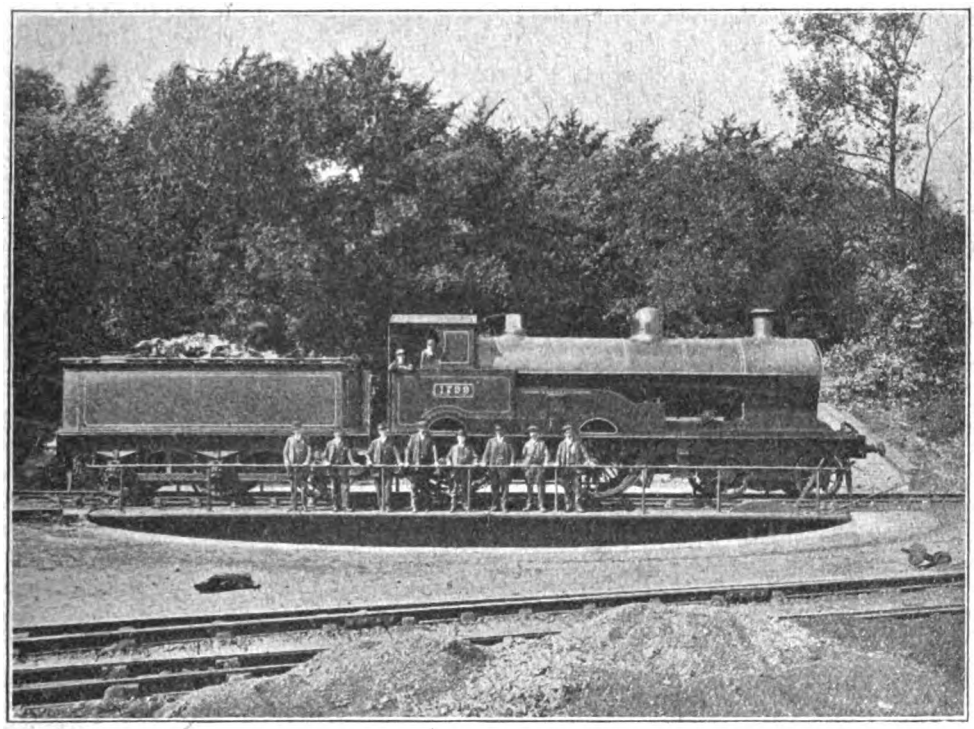
and used for lifting tenders, re-loading material in transit on wagons and any similar work that may be required.

In the power house there is an hydraulic accumulator 700 lbs. per sq. inch and a 4-throw pump in conjunction with same. In addition there is a separate 2-throw pump for 2,000 lbs. pressure, this being used to supplement the other pump when extra power is required as when taking the locking bars out and when the weight of the engine has to be lifted to get the wheels clear. A staff of "tubers" is employed in the shed for maintaining and refitting tubes in the boilers. The water at Bletchley is not of the best quality for locomotive purposes and a fair amount of boiler re-tubing has to be done in consequence of this. The staff further includes a dozen fitters, ten apprentices, two boiler-smiths, one blacksmith and his striker, the tool man and some labourers. Including the clerical staff and Mr. Taberner's chief assistants, the number of persons employed in normal times in the locomotive shed and offices at Bletchley is 312, with 62 at out stations.

A 10-ton breakdown crane is stationed at the shed. The six approach roads are supplemented by four other tracks bringing the total on the locomotive side of the railway to ten. The water for the locomotives is drawn from a reservoir situated at the south end of the passenger station between the main line and the Oxford branch. This is a large piece of water surrounded by banks, and with the encircling rushes and the swans which make it their home, it presents a by no means unpicturesque appearance. Immediately alongside of it on the main line there are located the nets for the collection of mail bags from the travelling post-office trains. Additional sources of water supply are obtained from wells at Fenny Stratford and from the Grand Junction Canal, which latter traverses the district and is close to the main line at several points. The tank of which an illustration is given, is mounted above the



LONDON AND NORTH WESTERN RAILWAY 4–4–0 SUPERHEATED "GEORGE THE FIFTH" CLASS, LOCOMOTIVE, NO. 1799, *Woodcock.*

This engine is stationed at Bletchley shed and is the locomotive that was in the Bletchley accident, August 11th, 1916. The Foreman, Mr. Taberner, and the staff are photographed in front.

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coaling stage, a substantially built brick erection at the north end of the locomotive yard. The capacity of the tank is 60,000 gallons. Two lines run through the opening between the brick piers underneath the tank, that on which the coal trucks run being inclined on the hump yard principle, whilst the track traversed by the locomotives to be coaled is level. The coal is shovelled from the trucks on to the tenders of the locomotives. In addition to this there is a coaling track outside the building and coal is tipped from small hand wagons on to the

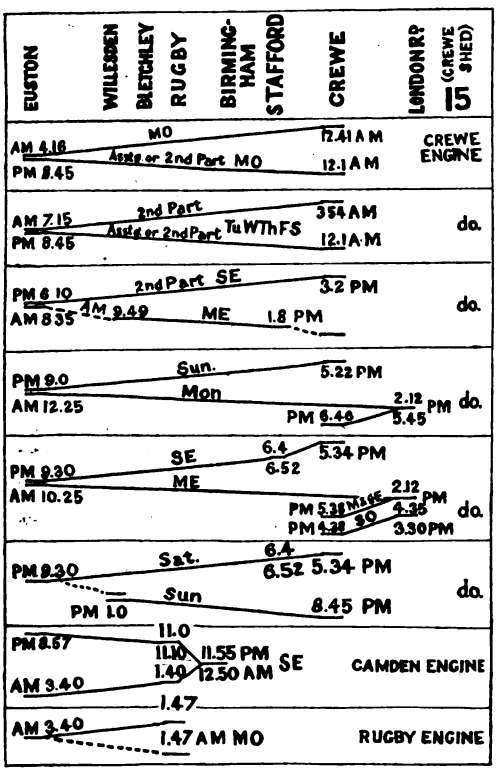

DIAGRAM OF LOCOMOTIVE WORKING.

tenders of locomotives standing thereon. The photograph shows this in course of process. The coal trucks are brought into the yard from coal trains and then delivered at the locomotive sidings, afterwards being taken to the south end of the yard and pushed up the hump line to the desired position. This same photograph shows the position of the turntable and the coal stack near it. The turntable is of 50 ft. diameter and will take all classes of London and North Western Railway engines with the exception of the "Claughton" four-cylinder express type.

Another photograph shows a locomotive of the "George the Fifth" class, *i.e.*, No. 1799, *Woodcock*. This was the engine involved in the Bletchley accident of August, 1916, and it is now stationed at Bletchley. Immediately in front of it are to be seen the foreman of the running shed, Mr. Taberner with some members of his shed and clerical staffs about him. The trees form an attractive background for the turntable, a point which, we understand has been commented upon many times by those whose attention has been called to this feature of the yard.

The third of the accompanying illustrations shows the original water tank of the locomotive department at Bletchley. This is located at the south end of the shed and has been out of use for about 40 years. The building below it is now used as a lodging house for enginemen and brakesmen, but it originally formed the offices of the locomotive department. It is further recalled that the running shed was originally a building of wood and galvanised iron containing three roads only and capable of stabling about 12 engines. It was blown down in 1876, temporarily burying the engines within it. One of the branch line drivers whose engine is shedded at Bletchley well remembers the night when this occurred, he being at that time a cleaner employed at the shed. It appears that it had been blowing hard all day and the climax was reached late at night when with little or no warning the building collapsed. There was fortunately no loss of life.

The system employed on the London and North Western Railway for controlling the movements of engines and the duties of their drivers is that known as the "diagram" system. One of the supplementary diagram sheets is reproduced herewith. From this a locomotive driver can ascertain exactly what he has to do during a given period. He first consults the "working" sheet which shows him what time he has to book on from day to day and the diagrams, which are set forth on a large board on a single sheet, enable him to ascertain precisely at what time he will leave, how he will spend the day and what time he will return. The wide end of the lines indicate the starting and finishing points and the narrowed ends the arrival at and departure from destination. It will be seen from the sheet reproduced herewith by consulting the uppermost diagram that the driver was to leave Crewe at 12.43 a.m. arriving Euston

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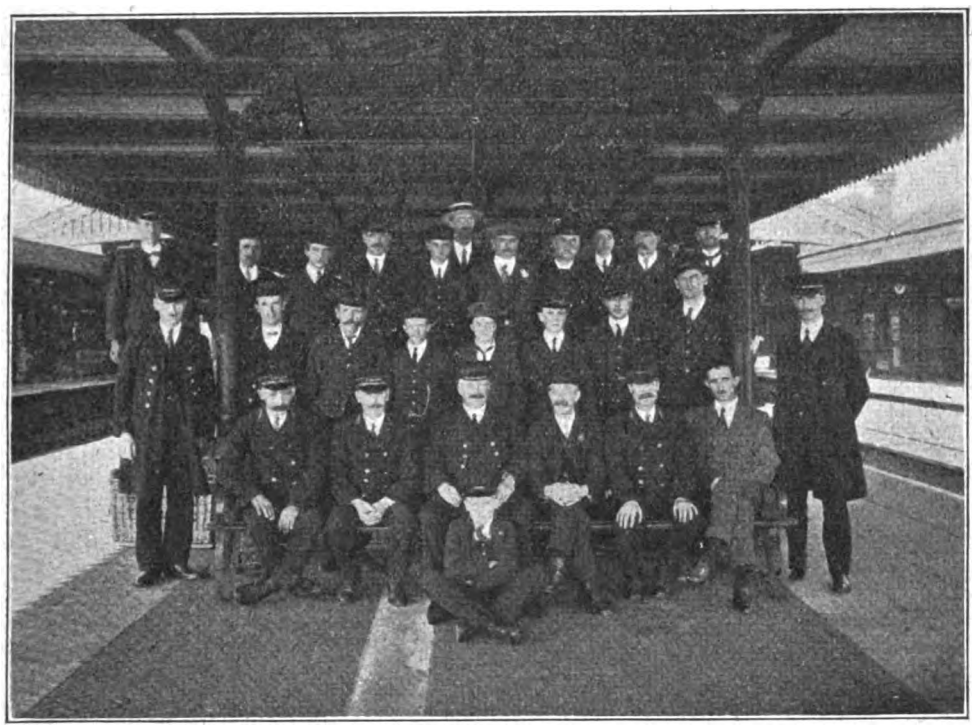
4.16 a.m. He would leave the same night with the 8.45 p.m. from Euston and arrive back at Crewe at 12.3 a.m., having rested the whole day at the London end. The trains (in this particular instance) are marked M.O. (Mondays only) and on the return trip it will be seen that it is the second part of the 8.45 p.m. train that he works to Crewe. Dotted lines on these diagrams indicate light engine working and joined lines show that there is no break between the outward and return trips such as to necessitate booking off and on again, and the whole principle of the system is to avoid this as much as possible. The sheet reproduced is merely a supplementary one, the main sheet in the running shed being of large proportions and showing the workings for all the engines over an indefinite period.

There is always an express passenger engine "standing pilot" at Bletchley in readiness to act as an assistant engine to main line trains if required or to take the place of a train engine should the latter fail for any reason. This engine is in steam night and day and is manned during the 24 hours by separate sets of enginemen. It is engaged in shunting duties, making up of trains, etc., during the day and indeed at all times when not required for work on the main line. The engine relegated to this work at the present time is No. 990, *Bucephalus*.

There are ten links of enginemen at Bletchley including those engaged in ballasting, shunting and banking, and the diagram sheets apply to both passenger and goods train working. A coffee tavern and an institute are provided by the Company for the use of the railway staff at Bletchley. These are self-supporting, and constitute a great boon to the men. The institute is equipped with reading room, a billiard table and other means of recreation.



BLETCHLEY STATION PLATFORM AND TRAIN CONTROL DAY STAFF.
Mr. Wenlock, Stationmaster and Chief Train Controller, is seated in middle of front row.

The writer as a daily traveller between Bletchley and London and *vice versa* has many opportunities of gauging the locomotive work performed on the London and North Western Railway main line and has nothing but praise for the very efficient manner in which these duties are performed. Thanks are due to Mr. C. J. Bowen Cooke,

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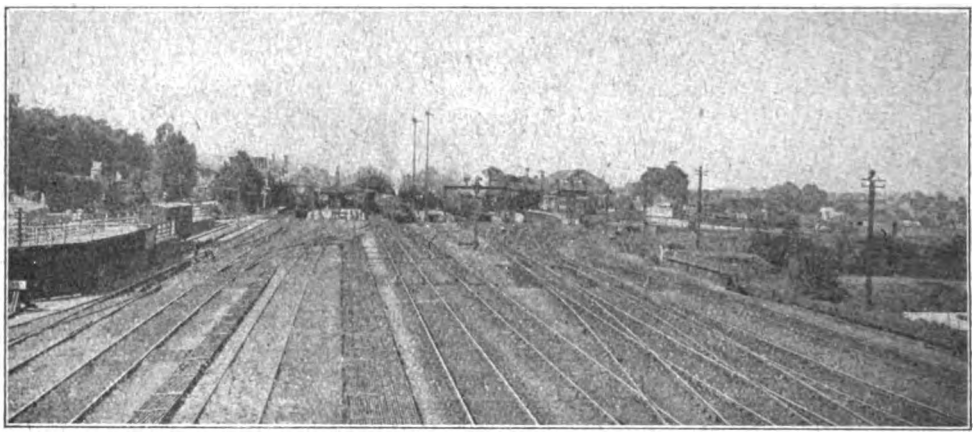

BLETCHLEY STATION FROM THE SOUTH END.
Oxford branch train on the left; up Euston express in centre; up slow line train on the right; Bedford and Cambridge lines on the extreme right.

Chief Mechanical Engineer, for the facilities granted in connection with the foregoing article and also to Mr. Taberner and his staff at Bletchley for their kindness in rendering every possible assistance on the occasion of the visit.

We have also added a photograph of a group of officials and others at Bletchley Junction. Seated in the middle of the front row will be seen Mr. T. F. Wenlock, who only recently assumed the position of station-master and chief train controller at Bletchley, and others present include members of the platform and train control staffs. Mr. Wenlock has had considerable experience in the employ of the London and North Western Railway and came to Bletchley from Nuneaton where he acted in the capacity of chief controller for some considerable time. His intimate knowledge of railway working combined with his unfailing courtesy to passengers and those around him generally have already assured him the respect and esteem of his staff, whilst he is universally liked by all those who come in contact with him. In him and Mr. Taberner the railway company has two most excellent servants.

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The Chosen Railways.

By R. W. A. SALTER.

ALL the railway lines in Chosen (Korea), except for the light railways, are under the direct management of the Railway Bureau of the Government-General of Chosen. They are of standard gauge, the rails weighing 76 lbs. per yard in the case of main line and 65 in that of branches. There is nothing remarkable to record regarding their history. The first line was undertaken in 1896 by an American, named James R. Morse, who secured a concession for the construction of a line between Keijo and Jinsen; but before the work was completed the concession, with all its privileges, was purchased by the Japanese Keijo-Jinsen Railway Company. This line was finished in 1899.

In 1901 a new Japanese railway company commenced to work from both ends of the peninsula, and in 1903 the Keijo–Jinsen Company was amalgamated with it. The 267 mile line between Fusan and Keijo was opened for traffic in 1905. A year later Railway Nationalisation Law was enacted, and the railways passed into the hands of the Government.

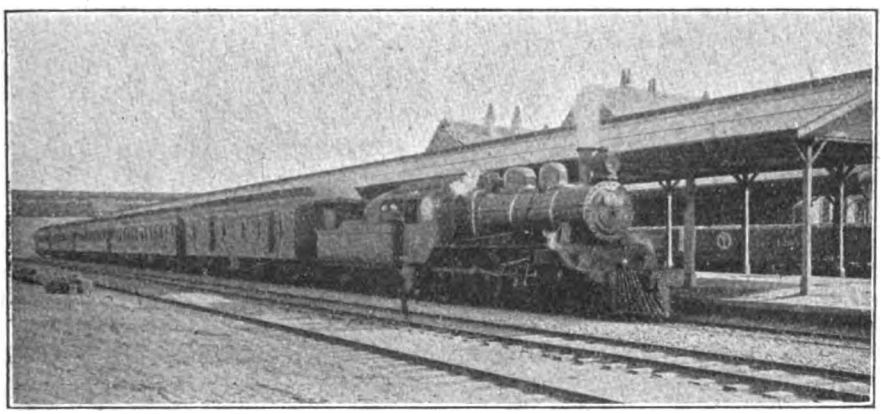
The more important units of the system, which comprises an aggregate traffic mileage in excess of 1,000 miles, are :—

Kei-Fu line	Fusan to Seidaimon (Seoul).
Kei-Gi line	Ryuzan to Antung.
Kei-Jin line	Yeitoho to Jinsen.
Kei-Gen line	Ryuzan to Gensan.
Konan line	Taiden to Mokuho.
Kankyu line	Southern division, Gensan to Yeiko.
	Northern division, Sheishin to Kainei (partly opened).

Branches extend, on the Kei-Fu line to Masan, on the Kei-Gi line to Kenjiho and to Hei-Nan, and on the Konan line to Kunsan.

For the most part the districts through which these lines pass are unlevel; moreover, as the Kei-Fu and Kei-Gi lines were built hurriedly, and without modifying natural conditions, there is a great deal of gradient and curve which is only being improved by necessity arising out of increased transportation and accelerated service. The improvement of the Kei-Gi line is now complete, bringing the heaviest grade down to 1 in 100. Similar work is now being carried out on the Kei-Fu line.

A grade of 1 in 40 is not uncommonly encountered on the Kei-Gen line, which traverses a mountainous part of the country.



FUSAN–ANTUNG EXPRESS AT RYUZAN.
Ryuzan is the headquarters of the Chosen Railways.

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A large number of tunnels are being excavated on this section. The Masan branch also has a grade of 1 in 40 for a short distance.

On the other hand, the Konan, Kei-Jin and Hei-Nan lines run mostly through plains; while the Kankyu line, along the sea-coast, which is now in course of construction, is expected to have practically no grades.

The locomotives of the Chosen Railways are classed as follows :—

Tank.	Tender.
2-6-0	4-4-0
2-6-2	4-6-0
4-6-4	2-8-0

The 4-6-0 engines include saturated, superheated and compound. The eight-wheelers and ten-wheelers are employed exclusively in hauling fast passenger trains, while compound ten-wheeler or consolidation locomotives are used for mixed and goods trains, and tank engines for local service and shunting.

In addition to four through passenger trains (two in each direction) daily to connect with trains on the Imperial Government Railways of Japan and the South Manchuria Railway, there is a weekly through express train called the Chosen-Manchuria Express between Fusan and Changchun, a journey of 944 miles, which is accomplished in 33 hours. Previously this train ran three times a week, but the outbreak of war and consequent uncertainty of service on the Siberian and Chinese Eastern Railway, as well as a great decrease in tourists, made it necessary for the service to be reduced to once a week.

The following is the number of trains in each direction on the different lines :—

Line.	Train.	No. of trains each way.	Remarks.
Kei-Fu	Chosen-Manchuria Express	1	Weekly
	Passenger trains	2	Fusan-Antung
	Mixed trains	3	
	Goods train	1	Fusan-Taiden
Kei-Jin	Passenger trains	3	
	Passenger trains (slow)	3	
	Mixed trains	2	
Kei-Gi	Chosen-Manchuria Express	1	Weekly
	Passenger trains	2	Fusan-Antung
	Mixed trains	2-3	Differ according to section
Konan	Passenger train	1	
	Mixed trains	1-4	Differ according to section
Kei-Gen	Passenger train	1	
	Mixed trains	1-2	Differ according to section

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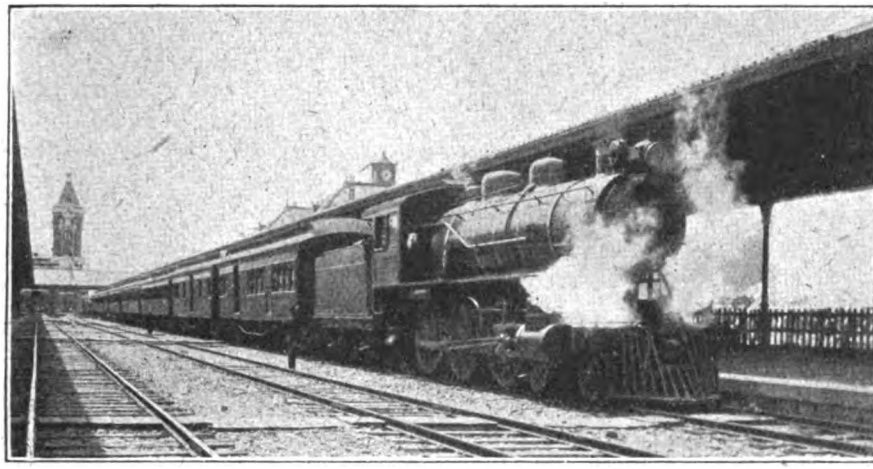


EXPRESS TRAIN LEAVING FUSAN FOR ANTUNG.
The trunk line of the Chosen Railways starts from Fusan in the south and terminates at Antung in the north.

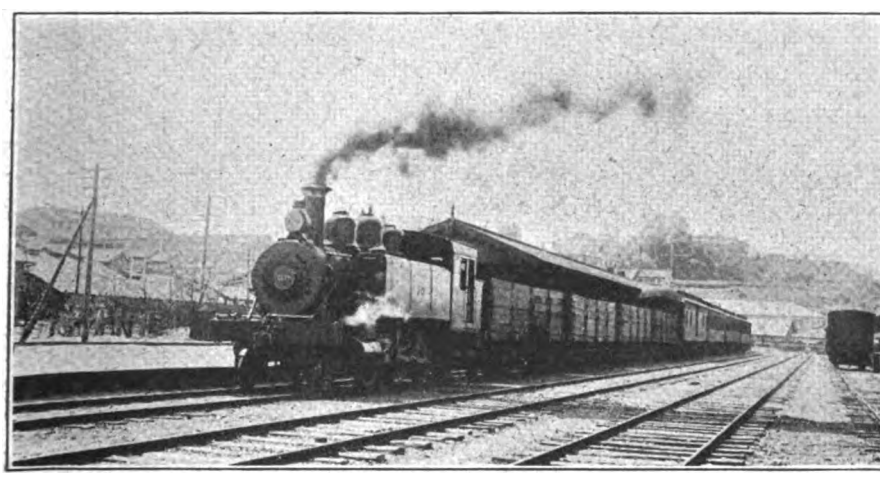
Besides the above, special passenger and goods trains are run according to necessity. There is a small extra charge, in addition to the ordinary fare, on the Chosen-Manchuria Express; and additional payment is necessary for reservation of a berth.

A *chef de train* is in attendance on the Chosen–Manchuria Express. Conductors wearing red bands round the left arm are on duty in every express train on the Fusan–Antung section. Train-boys wait on passengers in first and second class cars on all the

EXPRESS TRAIN BERTH FARES. (Including charges for bedding).

	First Class.		Second Class.	
	Adult.	Child.	Adult.	Child.
Under 200 miles	.. Yen 5.00 (10s. 8½d.)	Yen 4.00 (8s. 6¾d.)	Yen 3.00 (6s. 5d.)	Yen 2.50 (5s. 4½d.)
Under 600 miles	.. Yen 8.00 (17s. 1½d.)	Yen 6.50 (13s. 11d.)	Yen 5.00 (10s. 8½d.)	Yen 4.00 (8s. 6¾d.)
Over 600 miles	.. Yen12.00 (£1 5s. 8d.)	Yen 9.50 (£1 0s. 4d.)	Yen 8.50 (18s. 3d.)	Yen 7.00 (15s. 0d.)

(Approximate values in English money quoted in brackets.)



MIXED TRAIN ON THE JINSEN BRANCH AT JINSEN (CHEMULPO).

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express trains. The restaurant cars are well-managed. Breakfast costs Yen 1.00 (2s. 1½d.), luncheon, Yen 1.25 (2s. 8d.), dinner, Yen 1.50 (3s. 2½d.).

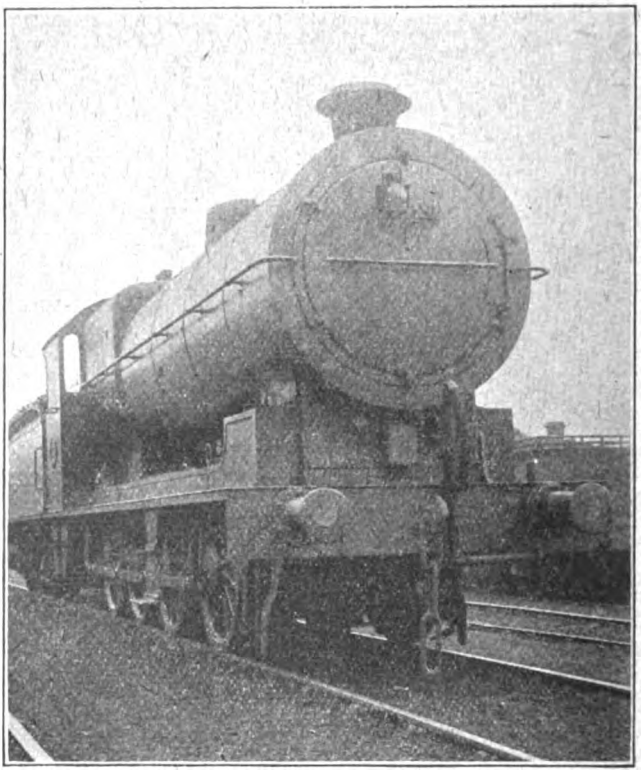
Passengers' tickets entitle them to the following amounts of baggage free :—

First class ..	100 kin (about 133 lbs.)
Second class ..	60 kin (about 80 lbs.)
Third class ..	30 kin (about 40 lbs.)

Fusan has an estimated population of 40,000, and is situated at the south-eastern extremity of the Chosen peninsula. Two daily steamers are operated by the Imperial Government Railways between Fusan and Shimonoseki (Japan), the voyage consuming 11 hours. Seoul is the seat of the Government-General of Chosen, and occupies a prominent position, being encircled by walls. A northward trip from Seoul to Shingishu traverses the most historic portion of the peninsula, of which the most famous is Heijo (Pyongyang), which was the oldest capital of Chosen, and borders on the River Daido, with wide expanses of fertile land to east and south. Antung is joined by a bridge over the Yalu River to the Antung–Mukden line of the South Manchuria Railway, which line forms a connection with the Peking–Mukden route.

In conclusion it may be mentioned that the Chosen Railways form an all-important link in the trans-Siberian route from Europe to Japan. Arrangements are in force for the through conveyance of passengers and their luggage from Western Europe and Russia *vid* Siberia and Korea. Normally the time taken on the through journey from London (or Paris) to Tokyo was 14 days, from Berlin 13, and from Moscow and Petrograd 11.

A SUPERHEATER 0-8-0.



Photo] [*W. H. Whitworth.*

LANCASHIRE AND YORKSHIRE RAILWAY :
Engine No. 1562.

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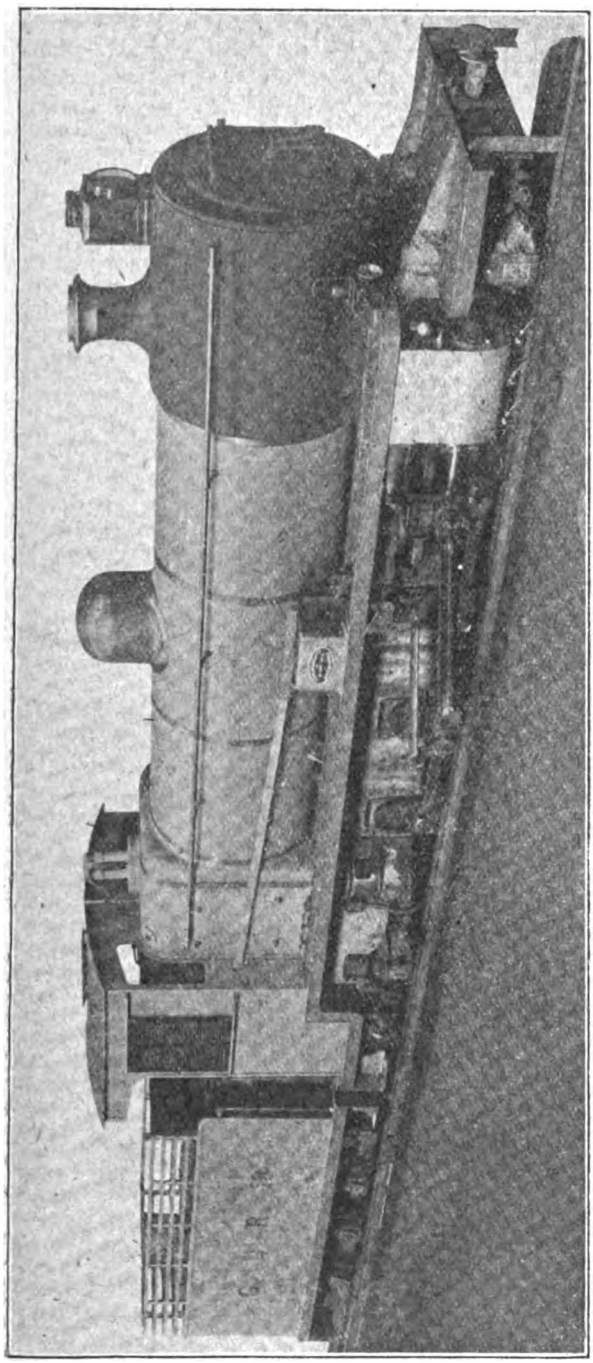
An Indian Light Railway Locomotive.



A PHOTOGRAPHIC reproduction and the particulars of a 2-8-2 type engine constructed for the Gwalior Light Railways by Messrs. Kerr, Stuart and Co., Ltd., Stoke-on-Trent, appears on this page. The locomotive is fitted with outside cylinders, and steam is distributed thereto by balanced slide valves actuated by Walschaert's gearing. The main frames, as well as those of the leading and trailing trucks, are carried outside the wheels.

For this gauge of engine the boiler is of large proportions, and the design throughout is of a thoroughly modern character. The firebox is of the Belpaire type, and an extended smokebox is fitted. The following are the leading particulars :—

Cylinders, diam. ..	12 in.
Stroke	18 in.
Coupled wheels, diam. ..	2 ft. 9 in.
Bogie wheels, diam. ..	1 ft. 6 in.
Wheelbase, rigid ..	9 ft. 9 in.
,, engine, total	20 ft. 3 in.
Heating surface, tubes	835·5 sq. ft.
,, firebox	64·5 ,,
,, total	900·0 ,,
Grate area	15·5 ,,
Working pressure	180 lbs. per sq. in.

The tender has a water capacity of 1,160 gallons and a coal capacity of 3½ tons.

The Gwalior Light Railways have about 250 miles open, all of 2 ft. gauge. They are worked by 26 locomotives, 87 carriages and 331 goods wagons. The proprietor is H.H. the Maharaja Scindia Alijah Bahadur of Gwalior.

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The Warwick and Leamington Railway.

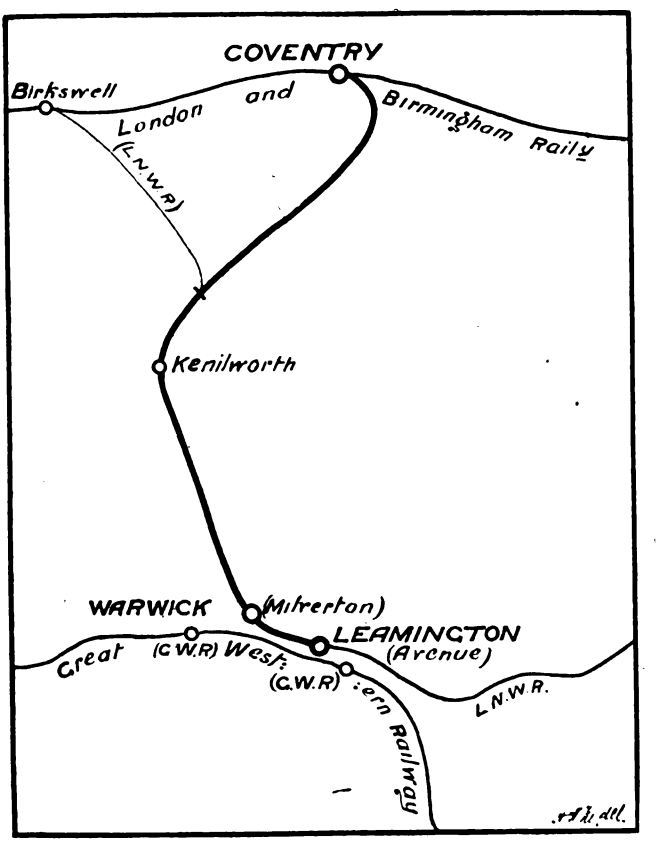
By H. H. MEIK.

THIS little railway was incorporated as a separate company in 1842 (5 Vict., Sess. 2, Cap. 81) for a line from the London and Birmingham Railway at Coventry to Warwick (Milverton) with a capital of £130,000 and loans to the extent of £43,000.

The line commences seven chains east of the present Coventry station and runs south-westwards to Kenilworth, the only intermediate station on the line—a distance of 5 miles. To the west of Kenilworth are the remains of Kenilworth Castle, while on the east side Stonleigh Abbey is situated. From Kenilworth the line runs southwards to Warwick (Milverton) which was the original terminus, crossing over on its way the River Avon by means of the Melbourne Grange viaduct. This viaduct was built of brick and stone and consisted of seventeen elliptical arches each of 30 ft. span. It was constructed on the switchback principle, the lowest point being near the centre, "a mode of procedure which produced a great saving of material and a considerable gain in the working speed."

Kenilworth station was an elegant and very light structure fitted with spacious booking offices, comfortable waiting rooms, etc., and stood within a quarter of a mile of the village with excellent approaches and a covered reception arcade for passengers.

The Warwick terminus was about midway between and adjoining the turnpike road from Warwick to Leamington, near the Birmingham and Warwick Canal, and contained all necessary accommodation for railway business; the waiting rooms were replete with every modern accommodation and were elegantly furnished with ottomans, couches, etc. The booking offices were fitted for the prompt dispatch of business.



At the north end was an Italian tower intended for the reception of a forcing pump and reservoir of water "so that a jet of water in case of fire could be instantly obtained."

Coventry station which was one of the principal intermediate stopping places on the London and Birmingham Railway was originally very inconveniently located, people and luggage having to go up and down a long flight of steps, besides the annoyance in bad weather to passengers who had to pass through the booking office and down to the platforms without any protection from the elements. A new station was afterwards erected according to Whishaw which was very well arranged.

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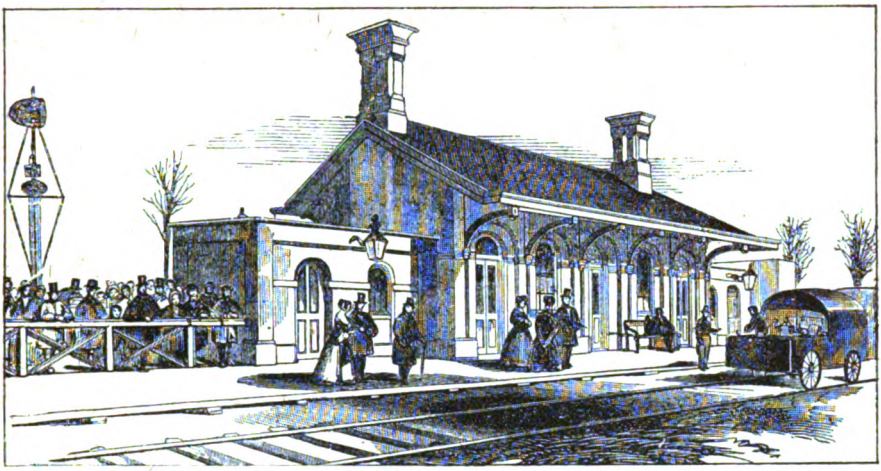

KENILWORTH STATION.
(From an old wood-cut.)

The platform being about two feet above the rails whereby stepping up to the carriages was avoided.

The length of the line was as near as possible 8 miles 52 chains, and the original cost amounted to upwards of £175,000, the excess of expense having been incurred in the purchase of land rights.

The distinguishing feature of the line was the undulating character of its gradients. "The entire length rises and falls like a surface of gently rolling ocean taken at any one moment of time, the ups and downs being so contrived that the impetus acquired in running down one incline is contrived exactly to compensate for the retardation of the next ascent."

The whole line, stations, permanent way, etc., was designed and carried out by Mr. Robert B. Dockray, resident engineer to the London and Birmingham Railway.

Before the railway was opened the London and Birmingham Railway acquired, by an Act in 1843 (6 Vict., Cap. 3) the line, and also procured powers to raise an additional capital of £673,000.

The line was originally opened as a single line on December 3rd, 1844, when the first train left Coventry a little after 9 a.m., its departure being witnessed and cheered by

MELBOURNE GRANGE VIADUCT.
(From an old wood-cut.)

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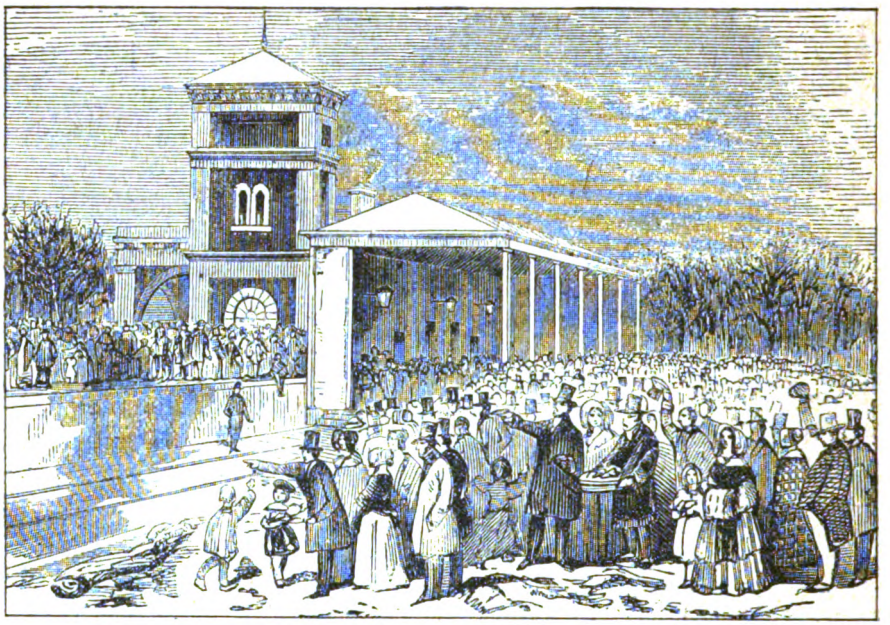

WARWICK TERMINUS.
(From an old wood-cut.)

a vast multitude of well dressed spectators, and at various points of observation "testimonies of respect were paid to the 'courageous inmates of the snug first classes,' on this their gallant venture."

At Leamington business was suspended for the day of the opening and festivities "of all sorts" were interchanged, and at night a dinner was held at the Regent's Hotel when Captain Musgrave (in place of Dr. Jephson) took the chair supported by the Hon. and Rev. Mr. Somerville and other gentlemen connected with Coventry. A deputation from the Nuneaton and Bedworth Railway (afterwards the Coventry and Nuneaton Railway—Act July 27th, 1847—opened September 2nd, 1850) headed by Mr. Wilkinson, chairman, was present and added to the good fellowship of the meeting.

By Act dated July 16th, 1846 (9 and 10 Vict., C. 204), the London and Birmingham, Grand Junction and Manchester and Birmingham Railways were amalgamated under the title of the London and North Western Railway, which by an Act in 1846 (9 and 10 Vict., C. 248) was authorised to extend the line from Warwick (Milverton) to Leamington (Avenue), a distance of 66 chains, and to raise additional capital to the extent of £85,000.

By an Act in 1847 (10 and 11 Vict., C. 278) the London and North Western Railway was authorised to make a line from Kenilworth Junction, 76 chains north of that station, to Birkswell Junction on the Rugby and Birmingham main line, and also to make an additional line of way from Coventry to Leamington.

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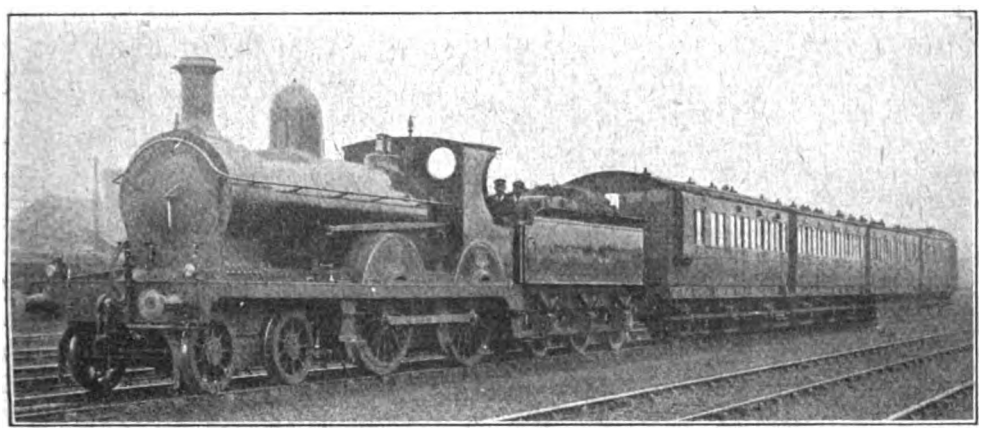
Locomotive and Train Working in the latter part of the 19th Century.

THE LANCASHIRE AND YORKSHIRE RAILWAY. [No. III.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

ONE of the earliest railways to construct its own locomotives was the Lancashire and Yorkshire, and the works at Miles Platting, then the property of the Manchester and Leeds Railway, turned out the first new locomotive—one of Hawkshaw's singles—at the end of 1846. By far the greater number of the Lancashire and Yorkshire engines were built there until 1875, although the years 1871 to 1875 saw the 101 Crewe built engines added to the Yorkshire at Miles Platting in 1878 to 1881, the remainder all being produced by outside firms. The last new engine built at Miles Platting was turned out in September, 1881, after which both works had to devote themselves entirely to repairs, and locomotive building by the company at its own works ceased for a period until the first engine issued from the new Horwich works in 1889.

As convenient locomotive works, those at Miles Platting left a good deal to be desired. They were very overcrowded both inside and outside, and their situation in the heart of a poor district of Manchester was not of the best, for there was no room for necessary extensions. In the old days things at Miles Platting had an unfortunate knack of vanishing into space. For not so very far from the works was a salubrious health resort called "Angel Meadow," through which the Lancashire and Yorkshire line passes. Why it is so called I am not sufficiently acquainted with the history of the locality to say, but it may be accepted as



Photo] [*J. M. Tomlinson.*

2–4–0 EXPRESS ENGINE, NO. 989 (978–1007 CLASS).
Wheels, 6 ft. 0½ in. Cylinders, 18 in. by 26 in. Pressure, 160 lbs. Joy's valve gear.
Designed by Sir John A. F. Aspinall. Built by Beyer Peacock and Co., Ltd., 1888–9.

stock, and twenty by private firms. There were also the East Lancashire works at Bury where the last new engines to be constructed came out in 1877, and Bury shops were always used for the repairs of all engines numbered above 600, whilst those below 600 went to Miles Platting. But the accommodation at both places was severely overtaxed, and of the large number of new engines of all classes constructed by Mr. Wright, only 40, all "ironclad" goods engines, were built by the Lancashire and

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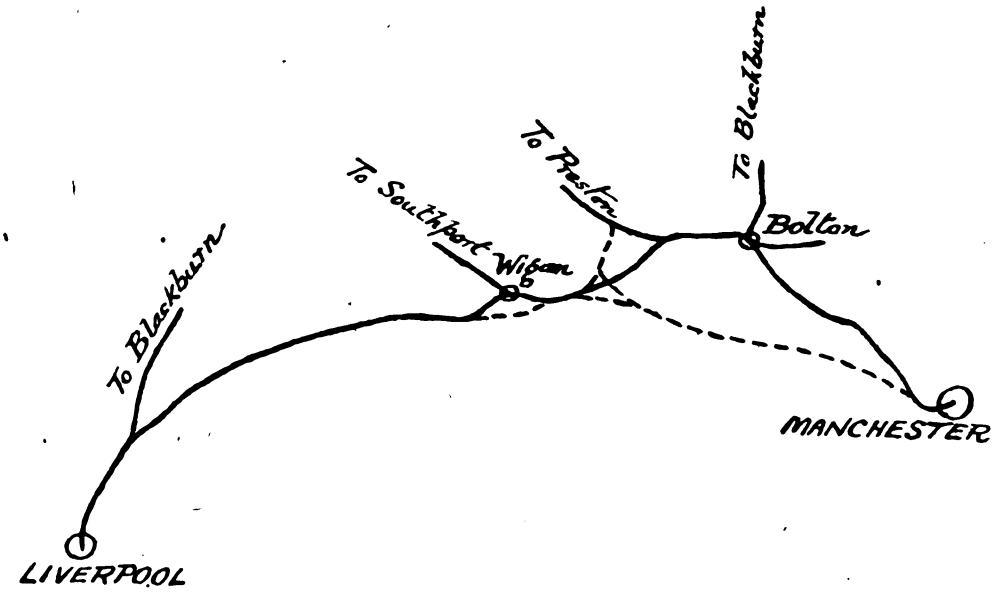

LANCASHIRE AND YORKSHIRE RAILWAY. NEW ROUTES, 1888.

confidently certain that no angel, other than any that may have been connected with the Manchester police force, ever attempted to make acquaintance with its verdant pastures. A fair proportion of the denizens of the Meadow were connoisseurs, and included in their very comprehensive *repertoire* were such things as old brass and other metals of various sorts, such as go towards the make-up of a locomotive engine. A good many years ago the works authorities at Miles Platting placed an old engine in a siding not far from one of the streets, where it attracted the attention of some of the connoisseur fraternity, who got on to the siding and made investigations. Amongst other valuable information gleaned by them was the fact that a locomotive possessed certain brass boiler fittings, and in addition to this information in the abstract they also gleaned most of the fittings in the concrete as well. Then the next day other parts of the locomotive went also. And as they do not like to do things by halves in Manchester, a few nights later a lorry arrived unobtrusively on the scene, with the result that when as much of the sun as Miles Platting ever sees, rose the next morning, it was stated that there was no boiler on the engine. How this daring theft was carried out I never heard, but it may be added that as the engine was one of the old ones—I believe it was a four-wheeled goods engine—the boiler would be a very small one. Moreover it is very probable that somebody inside the works had a share in the business.

The description of the locomotives having been brought down to 1887, it is now necessary to revert to the improvements and developments in the Lancashire and Yorkshire train services. Except in the year 1888 the changes were not abrupt, rather was it a steady gradual alteration, which in the end proved none the less drastic in effect, for the old was completely swept away. By 1883 a well marked change for the better had taken place in the locomotives, but there was not a single train to which Foxwell's definition of express, *i.e.*, one with a journey speed of 40 miles an hour, could be applied. In this respect the Lancashire and Yorkshire suffered from its geographical features. The large number of extremely busy towns which have to be served do not conduce to high speeds; moreover the gradients of the main lines are exceptionally severe.

The year 1883 saw the Bradford–Huddersfield–Penistone branch changed into a main line. Prior to 1878 there were two routes from Bradford to Huddersfield, one *viâ* Cleckheaton and Mirfield (15¾ miles) and a much more circuitous one *viâ* Halifax and Brighouse (19 miles). As mentioned previously, a new line was then opened from Wyke Junction on the line between Low Moor and Halifax, to Clifton Road Junction

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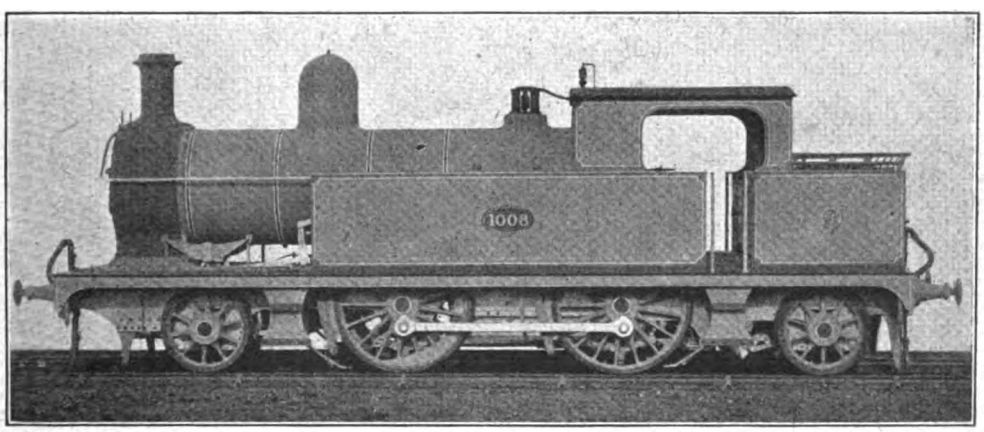
near Brighouse, which reduced the distance between Bradford and Huddersfield to 12¾ miles, and at the same time avoided the constant delays near Mirfield caused by the London and North Western Manchester and Leeds trains, which used the Lancashire and Yorkshire Railway metals from Heaton Lodge Junction to the London and North Western junction between Mirfield and Thornhill. The three alternative routes were used by different trains as is still the case to-day. Trains from Bradford to Penistone took the new route; to Meltham they usually travelled *viâ* Mirfield, and the Bradford–Holmfirth service was usually conducted by the long Halifax route. In 1883 the Manchester, Sheffield and Lincolnshire and Great Northern Railways started their special London–Manchester expresses, and in order to keep up and improve the Huddersfield connection *viâ* Penistone, there were through Great Northern carriages from King's Cross. These coaches however were worked from Bradford (Lancashire and Yorkshire) on expresses for Huddersfield and Sheffield, and thus began the use of the new road for express trains. The running of these London coaches as between Bradford and Huddersfield was afterwards discontinued for a time, but was revived when the Great Central opened its new London line, and now a number of corridor dining-car expresses, horsed by the heaviest Lancashire and Yorkshire Railway four-cylinder 4–6–0 engines are run between Bradford and Sheffield for Marylebone and other Great Central and also Great Western stations

The next step was the invasion of York by the Lancashire and Yorkshire Railway, which took place in 1884. York was the Mecca of all railways that entered Yorkshire, but all the roads leading to it were and are in the hands of the North Eastern Railway. The Great Northern had run there over the North Eastern metals from Askern Junction, and previously *viâ* Knottingley, from time immemorial, and the Midland had effected an entry into York *viâ* the Swinton and Knottingley joint line in 1880. The Lancashire and Yorkshire was the third company to get through. So long as the North Eastern owned the road, and could exact their pound of flesh, it paid them to allow other companies to do the working of the trains for them. Hitherto the Lancashire and Yorkshire Railway trains had terminated at Normanton (Midland), where passengers for North Eastern stations had to turn out and wait a considerable time before the North Eastern deigned to move them out. By arrangement with both the North Eastern and the Midland Companies the Lancashire and Yorkshire started a new service of express trains between Manchester and York (75¼ miles) which averaged 2 hours 7 min. for the journey, a mean speed of 35·6 m.p.h. including stops, and 41½ m.p.h. exclusive of stops. The Midland had naturally to give their consent, as the Lancashire and Yorkshire trains use the Midland main line from Goose Hill Junction south of Normanton to Altofts Junction, where the North Eastern diverges to the right, a total distance of about 1¾ miles. In 1885 this service was



2–4–2 STANDARD TANK ENGINE, NO. 1008.
Wheels, 5 ft. 7⅛ in. Cylinders, 18 in. by 26 in.
Designed by Sir John A. F. Aspinall. Built at Horwich, 1889.

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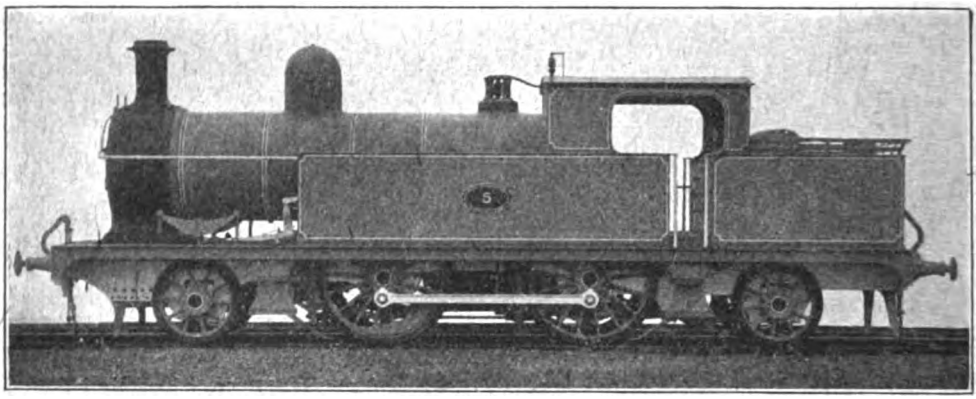

2–4–2 TANK ENGINE, No. 5.
1008 class with extended bunker. Built at Horwich, 1898.

worked by the Lancashire and Yorkshire Railway 4-4-0 engines 873, *Edward Green*, and three other Kitson engines of the 863–882 series, stationed at York, and in 1887 they were replaced by the Vulcan Foundry engines 300, 694, 698, etc., all of which have been mentioned already. After some of the 980 class to be described later had had a turn on the York road, the trains were in 1894 handed over to some of the 1220–1229 series of Sir John Aspinall's 7 ft. 3 in. 4-4-0 engines, which worked this service for many years. Incidentally this change enabled the Lancashire and Yorkshire Railway to put on through coaches between Lancashire and Scarborough, and ultimately there developed a Liverpool to Newcastle express service in competition with the London and North Western Railway. These trains were afterwards considerably accelerated and then performed the longest non-stop runs of the Lancashire and Yorkshire Railway, *viz.*, the 47¾ miles from Manchester to Wakefield in 58 min., a speed of 49·4 m.p.h. This, however, is anticipating somewhat, as these long runs did not come into existence until near the close of the 19th century.

The year 1888 saw other changes. The Midland made an agreement with the Lancashire and Yorkshire Railway whereby their own engines and stock worked the whole of the Midland Scottish connecting trains between Manchester (Victoria) and Hellifield, and stabled several of their engines at the Lancashire and Yorkshire Railway sheds at Newton Heath for the purpose. Similarly, by stationing Midland engines at the Lancashire and Yorkshire sheds at Sandhills, they also worked the Liverpool connections between there and Blackburn where they joined the Manchester portions. About a year later the Midland made a further invasion of the Lancashire and Yorkshire Railway by working through London expresses from Marple *viâ* Ancoats Junction and the Phillip's Park loop to Manchester (Victoria), Bolton and Blackburn. The combination of Midland, Scotch and London services practically took almost the whole of the Manchester–Blackburn express trains out of the hands of the Lancashire and Yorkshire engines and turned them over to Midland engines. There was one distinguishing mark that denoted Lancashire and Yorkshire ownership. As the Midland had no second class carriages, every Midland train had a six-wheeled Lancashire and Yorkshire second class coach sandwiched into it, for the accommodation of passengers of this class between Manchester, Blackburn and Hellifield.

But it cannot be said that there has been any improvement in the speeds over the Manchester–Hellifield route. In 1880 the time between Manchester and Hellifield was 90 min., probably much the best Lancashire and Yorkshire work of that day. The present trains show an average of 92 to 95 min. for the same journey. For the working of Blackburn–London trains the Midland also hired stabling accommodation at the Lancashire and Yorkshire shed at Over Darwen for two engines which worked to Marple—and later to Chinley, but they subsequently removed their engines from Newton Heath (Manchester) to their own sheds at Belle Vue, which would involve for them a good deal of light engine mileage.

In revenge the Lancashire and Yorkshire

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Railway began to invade the Midland. When the Midland opened their line between Skipton and Ilkley in 1889, the Lancashire and Yorkshire Railway, which had for many years exercised running powers over the Midland line from Colne to Skipton, extended them and worked a few through trains from Manchester to Ilkley. And a few years ago the Lancashire and Yorkshire Railway took complete possession of the new Midland line from Thornhill to Royston, so far as passenger trains are concerned, and worked the whole of the new Midland service from Bradford (Lancashire and Yorkshire) to Sheffield. This service is, however, a product of the present century. In 1888 the following express services were run by the Lancashire and Yorkshire Railway, of which the list has been taken from Foxwell and Farrar's "Express trains."

Of the York trains the 12.15 p.m. from Manchester took 1 hour 55 min., or over 39 miles an hour including stops. This was 5 min. better than the fastest London and North Western Railway train of that day.

Of the Blackpool trains both were up trains to Manchester from Talbot Road, but the Lytham trains were also Blackpool (Central) expresses.

The two authors remark that "this is not a large total, but a very welcome one since scarcely any of it existed five years before. The rolling stock has improved as much as the speeds, and altogether the record is hopeful."

But the same year saw the most important change, one that really converted the old Lancashire and Yorkshire Railway into an express line. This event was the opening of the new and shorter route between Manchester and Liverpool. The Lancashire and Yorkshire was, as befits its name, very much in evidence at both cities, but had no really direct route between them. The old road *viâ* Wigan and Bolton was 39½ miles long, and although there had existed for many years a service of trains, no traveller from either city ventured to use it unless he had some time on his hands and specially wished to see the verdant dales and picturesque glens of the Wigan district. The competing lines of the London and North Western Railway (31½ miles) and of the Cheshire Lines (34 or 34¼ miles *viâ* Warrington), upon both of which an hourly service of fast expresses was maintained, completely ruined any chances that the Lancashire and Yorkshire Railway then had. The new route is shown in dotted lines on the annexed sketch map, and left the old Manchester–Wigan line at Pendleton Junction, rejoining it near Hindley. A short loop to the south of Wigan avoided that town, but the old line was used from Pemberton Junction, west of Wigan, to Liverpool. The total distance was reduced to 36½ miles, but the new route, in spite of heavy gradients, was eminently suitable for fast traffic and moreover had four roads to Hindley, thus avoiding the crowded junctions in the Bolton and Wigan districts.

Miles.	Between	Number.	Average time.	Speed.		Mileage.
				Inclusive.	Exclusive.	
			H. M.			
75½	Manchester—York ..	4 down, 2 up	2 7	35¾	41½	453
28¾	Liverpool—Bolton ..	18	0 45	38¾	41	517½
35	Manchester—Southport ..	2	0 55	38	39½	70
48¾	Manchester—Blackpool ..	2	1 16	38½	39½	97½
51	Manchester—Fleetwood ..	2	1 20	38¼	39¼	102
44¾	Manchester—Lytham ..	2 up, 4 down	1 7½	39¼	40	268
						1508

The Lancashire and Yorkshire immediately set about competing for a share in the extensive passenger traffic between the two cities, and instituted a service of 45 min. trains, which left each city at 30 min. past every hour. To make them more useful they were arranged to be through trains to Leeds, though one or two in each direction were also through trains between Liverpool and Bradford. These trains at once added a large express mileage to the small amount hitherto run by the Lancashire and Yorkshire, for there were no less than 13 trains in each direction. The average running speed of the new expresses was 48¼ m.p.h., but a

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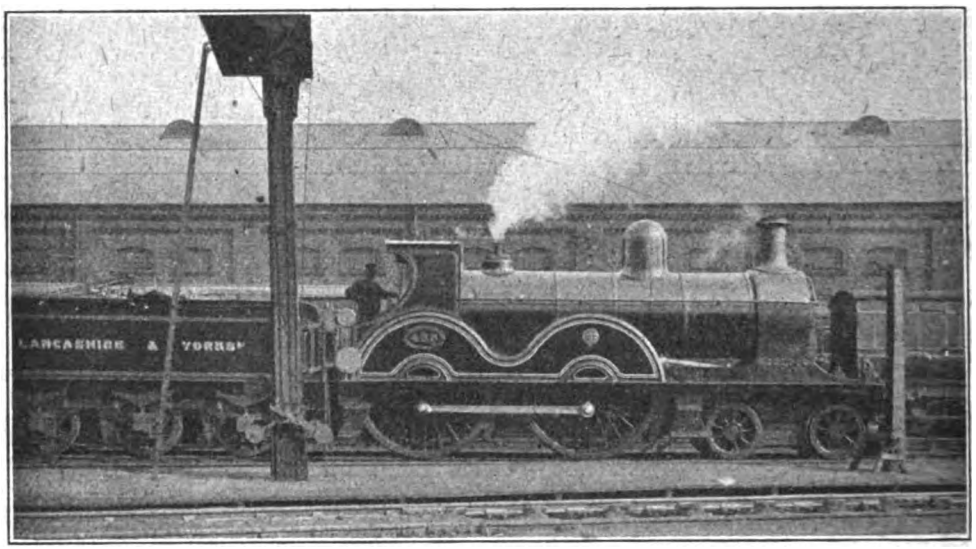

4–4–0 STANDARD EXPRESS ENGINE, NO. 488.
Wheels, 7 ft. 3 in. Cylinders, 18 in. (some 17½ in.) by 26 in.
Designed by Sir John A. F. Aspinall. Period, 1891–1894.
The first ten, Nos. 1093–1102, had 19 in. by 26 in. cylinders.

number of years later some of the trains were accelerated to a 40 min. schedule, which gave a mean speed of 54·4 m.p.h. A somewhat awkward locomotive problem had to be solved. All the Lancashire and Yorkshire Railway 4–4–0 express engines had driving wheels only 6 ft. in diameter, a size amply large enough for the main lines to Yorkshire, etc., and eminently suitable for the trains which had had to be run hitherto, but hardly large enough for the new expresses. The arrangement made was that the 6 ft. bogie engines worked the expresses between Leeds or Bradford and Manchester. The trains consisted of three eight-wheeled bogie coaches from Leeds to Liverpool and about five six-wheeled coaches in the rear from Bradford to Manchester. A short time afterwards the Bradford portion was altered to consist of three eight-wheeled bogies similar to the Leeds portion. At Manchester the 6 ft. 4–4–0 engine was detached, and the old Crewe-built 6 ft. 7½ in. 2–4–0 Ramsbottom's Nos. 456 to 462 and 731 to 733 were pressed into service. These were the largest wheeled engines that the Lancashire and Yorkshire Railway possessed; they were reboilered but remained substantially in their original condition except that the splashers had been closed. For a time they worked almost exclusively upon the new Manchester and Liverpool service, and retired from it only when Mr. Aspinall's new 1093 to 1112, 4–4–0 engines with 7 ft. 3 in. wheels, were built at Horwich in 1891. It is true that the 6 ft. engines, generally the 978–1007 class, frequently ran through to Liverpool on the new expresses, but their wheels were really too small to make them suitable for the work, although they generally managed to keep good time.

After the new 1093 class had been put to work the changing of engines at Manchester was abandoned. Nos. 1100 to 1112 were quartered at Low Moor, and 1093 to 1096 at Liverpool for the through runs from end to end.

The new Liverpool trains had the effect of somewhat improving the service between Manchester and Leeds and Bradford. There was a train at practically every hour—leaving Manchester at 9.25, 10.25, etc. To avoid too frequent stoppages, it was generally arranged for alternate trains to stop at Rochdale, and those that ran through this station stopped at Todmorden instead. All trains stopped at Halifax, and it became usual to separate the Leeds and the Bradford portions at this station instead of at Low Moor, and thus save delay to the Leeds portion. In the late nineties one or two of the Leeds expresses were continued to Harrogate. "Continued" is perhaps not the correct expression, for the trains ran into Leeds (Central), and a Lancashire and

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Yorkshire 2–4–2 tank engine was hooked on to the other end, and by going back over the same metals towards Holbeck, the train descended on to the North Eastern line behind Holbeck Midland station, and reached Harrogate (18 miles) *viâ* Arthington without intermediate stop. The working was distributed between the two companies in the usual manner—the Lancashire and Yorkshire Railway provided the engine and carriages, and the North Eastern Railway annexed a great part of the shekels.

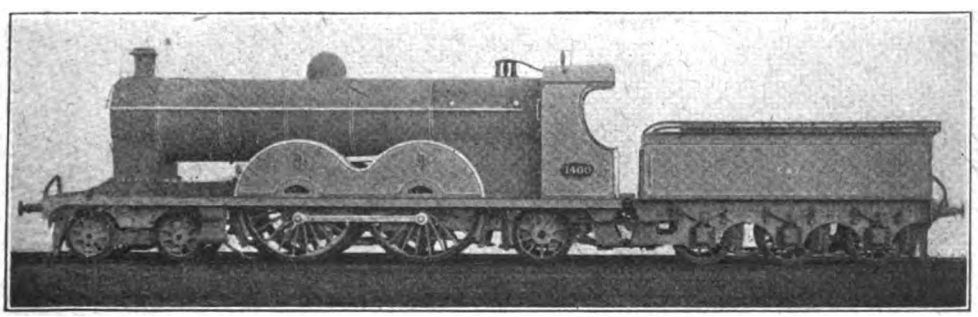
Naturally, on the other hand, there were compensating advantages to the Lancashire and Yorkshire, and also to the other companies who were so anxious to exercise running powers over the various North Eastern lines. The running Company tapped the traffic at its source before a confiding public had time to think the matter over and get into a rival Company's train. As for the North Eastern Railway, since the traffic had perforce to come on to their line in the end, it did not matter much who brought it, so everybody was satisfied.

To return to 1891, by which time the new services between Liverpool and Leeds had thoroughly settled down, the average time between Manchester and Leeds was 1 hour 20 min., though the 9.25 a.m. from Manchester got through in 1 hour 17 min. The usual timing from Manchester to Todmorden (19¼ miles) was 30 min., the run being uphill for almost the whole distance. The 22¼ mile runs between Rochdale and Halifax were done in 29 min., and the old established 9.25 a.m. from Bradford ran through from Halifax to Manchester, 32¾ miles, in 41 min., a speed of 48 m.p.h. These performances were a vast improvement on the old timings of some years previously. Sowerby Bridge, a station of great importance in the old Lancashire and Yorkshire days, had dropped into a second rate position, although well served by other trains.

The new line from Pendleton Junction to Hindley not only gave the Lancashire and Yorkshire a much improved route from Manchester to Liverpool, but it also made an equal improvement to Wigan and Southport, by reducing the distance by 2½ miles. In 1891 the best express, the 5 p.m. from Manchester ran through to Southport (St. Luke's) 34¼ miles, in 45 min. Twenty years later the time allowed was 44 min. From Wigan to Salford, 17¼ miles in the opposite direction, was covered in 22 min., speed 47 m.p.h.

The same new line also afforded an alternative route to Preston and Blackpool, by means of a "cross country" connecting line from Dobbs Brow Junction to Horwich Fork Junction. The distance, however, is only some 70 yards shorter, but the advantage to a fast train lay in the avoidance of Bolton. The best run in 1891 was from Poulton to Salford, 44½ miles in 59 min., which included the slackening through Preston and its approaches, and was a really good performance.

One additional train service has yet to be mentioned. Towards the end of the 19th century the Lancashire and Yorkshire appeared suddenly to remember that the Wakefield and Goole line might be turned to further account, for being at the end of the Lancashire and Yorkshire earth, it had hitherto served for the running of extremely slow trains, and also as a convenient retreat, where retired express engines on half pay could end their days in peace. In the late nineties a number of Mr. Wright's 4–4–0 engines of the 813–832 series by Neilson were finishing their careers on this



4–4–2 EXPRESS ENGINE, NO. 1400.

Wheels, 7 ft. 3 in. Cylinders, 19 in. by 26 in.
Designed by Sir John A. F. Aspinall. Built at Horwich, 1899.

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road, although they were then only about 15 years old. In addition to the North Eastern towns of York and Harrogate, Hull also became an objective for the various railways that sat round the North Eastern table, and by means of its Goole branch the Lancashire and Yorkshire arranged for a through service to Hull from Lancashire to compete with the rival Manchester, Sheffield and Lincolnshire (Great Central) and London and North Western Railways. The Lancashire and Yorkshire at Goole passed underneath the North Eastern line from Doncaster to Staddlethorpe, and ended at a low level terminal station. By means of an existing connecting line trains coming from the direction of Wakefield can, when approaching Goole, run straight up to the North Eastern station and thence continue their course to Hull. The new expresses took the 27 mile stretch from Wakefield to Goole without stopping at Pontefract, to the great disgust of the burgesses of that ancient Yorkshire borough, and the time allowance for this run was 37 min. Goole (Lancashire and Yorkshire) station was discarded also by the local stopping trains, all of which began to use the high level North Eastern station, though the exact year when these changes took place I do not at the moment remember. The Hull expresses were worked from Manchester as part of the York trains, and the two portions were divided at Wakefield.

In dealing with the newer train services between 1888 and 1900, I have had to leave the later locomotive developments of the Lancashire and Yorkshire. An entirely new era may be said to have begun in 1888, and the present locomotive stock virtually dates from that year. Horwich works had not yet been completed though repairs were being executed there, and therefore Mr. Aspinall, then the new chief of the locomotive department, placed an order for express engines with Messrs. Beyer Peacock and Co., who built thirty in 1888–9, the last Lancashire and Yorkshire engines to issue from the works of a private locomotive building firm.

The new 4–4–0 engines retained the 6 ft. diameter of coupled wheels, but the cylinders were enlarged to 18 in. by 26 in., and the boilers with more heating surface than the previous classes had the new standard pressure of 160 lbs. From this time Joy's valve gear was definitely adopted as a standard for all except a few shunting engines, and has remained so until the present day. The boiler was considerably enlarged to have a total heating surface of 1,229 sq. ft., in place of the 1,026 sq. ft. of the earlier 4–4–0 engines, and the weight in working order was increased from 41¾ tons to 43¼ tons. A somewhat larger tender was adopted. The Lancashire and Yorkshire tenders were not very large, and the previous engines carried only 1,780 gallons, a capacity increased to 2,000 gallons in the new engines. Nos. 978 to 997 were mostly stationed at Manchester and other principal Lancashire sheds, whilst 998 to 1007 went to Low Moor to run to Manchester, Liverpool and Blackpool. They are still at work with the exception of 987, which was so badly damaged in 1901 in an accident to a York express at Todmorden that it had to be scrapped.

The first new engines to be built at Horwich works came out in 1889, and were numbered 1008 to 1017. They were the first of the well-known 2–4–2 "double end" passenger tank engines, which are now almost universal on the Lancashire and Yorkshire, and have coupled wheels 5 ft. 7⅞ in. diameter, 18 in. by 26 in. cylinders and 160 lbs. pressure. The first ten were sent for duty on the Liverpool and Southport line, and 20 more which followed in 1890 were principally put to work in the Manchester district. In 1892 more engines of the same class came out, of which some put in an appearance at Low Moor and other Yorkshire sheds. Since then they have practically taken over the whole of the Lancashire and Yorkshire passenger trains except the through main line expresses, and they are even to be seen occasionally working some of these. The tank capacity of those built from 1889 until 1898 is 1,340 gallons, so that in this respect they were not far behind the water carrying capacity of the older tender engines which they replaced, and moreover they were much handier for the heavy local traffic of this railway than tender engines. In 1898 a modification was made by lengthening the "bunker" tanks of those constructed from that date, and thus increasing the water capacity to 1,540 gallons.

The first 4–4–0 express engines with large wheels 7 ft. 3 in. diameter came out in 1891. Of these Nos. 1093 to 1102 had cylinders 19 in. by 26 in., and 1103 to 1112 had 18 in. by 26 in. cylinders. The pressure was 160 lbs. per sq. in. Engines 1093 to 1096 went to Liverpool to run to Leeds, 1097 to 1099 were generally on Manchester-Blackpool

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trains, and 1100 to 1112 went to Low Moor. After giving a full and careful trial to both 18 in. and 19 in. cylinders, Mr. Aspinall decided upon the smaller diameter, probably in order to prevent the enginemen from running the engines "out of breath," which was apt to occur occasionally with the 19 in. cylinders. Twenty more of the same class with 18 in. and 17½ in. cylinders came out in 1894, of which 318, 338, 339, 344 and 368 were added to the Low Moor stud, 429, 430, 455, 488 and 498 stationed at Newton Heath and other Lancashire sheds, and 1220 to 1229 were mostly put to work between Manchester and York.

In 1901, engine 1112 of the above class was rebuilt as a four-cylinder compound engine with outside H.P. cylinders 12⅝ in. by 24 in. and inside L.P. cylinders 21⅝ in. by 26 in. I saw this engine sometimes on the Hellifield road, and at one time on the York trains, but had no personal experiences of its performances on other than slow trains. Generally speaking the arrangement was very similar to that of the London and North Western Railway "Jubilee" class (Nos. 1901 to 1940). At a later date 1112 was reconverted to her original form.

Of the performances of the various classes of Lancashire and Yorkshire Railway 4–4–0 engines, I have not kept many of my old notes, for there was nothing specially remarkable in those of the earlier 110 6 ft. engines. The old 9.25 a.m., afterwards 9.35 a.m., train from Bradford, by which I was a very frequent traveller, used at one time to run from Sowerby Bridge to Manchester, and with engines 886 and 300 I have timed this run of 28¾ miles in 35½ min., a speed of 48·6 m.p.h. with a load of about 150 tons.

With 994, one of Mr. Aspinall's 6 ft. engines built by Beyer Peacock and Co. in 1888, the through Wakefield–Manchester run of 47¾ miles was done in 56¾ min., 1½ min. under time with a load of about 140 tons, a speed of nearly 50½ m.p.h. With the 1093 class I found the Liverpool–Manchester run to be performed in 41 to 41¼ min. on several occasions with loads of three bogie coaches.

The last Lancashire and Yorkshire express engines of the 19th century were the celebrated 1400 class, 4–4–2 engines with 7 ft. 3 in. wheels, 19 in. by 26 in. cylinders, and huge boilers. These came out in 1899 and are so well known that it is unnecessary to repeat data that have frequently been given in the RAILWAY MAGAZINE. They were mostly put to work on the Liverpool–Bradford and Leeds trains, and on the more important Manchester to Southport and Blackpool expresses.

Since the foregoing was put into type, I have received a note from a Liverpool correspondent that during the 'eighties two of the 6 ft. 4–4–0 bogie express engines of Mr. Wright's design were stationed at Lytham to work the business residential expresses between Blackpool (Central) and Manchester. At first these were Nos. 669 and 670 of those built by Sharp, Stewart and Co. in 1881, and at a later date they were replaced by 865 *Prince of Wales* and 866 *Princess of Wales*, by Kitson and Co., 1885. In those days there was no shed at Blackpool (Central), the engines being stabled at the old passenger station at Lytham, and generally ran light between there and Blackpool at the beginning and end of their day's work. Lytham also stabled a few of the small 2–4–0 saddle tanks which worked locally between Blackpool (Central) and Kirkham. At one time I remember Nos. 6, 8, and 20 on this service.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—
L. & N.W.: Jan., Feb., March, May, 1915.
Great Northern: June, July, 1915.
M.S. & L.: Aug., Sept., Oct., 1915.
Great Western: Nov., Dec., 1915; Jan., Feb., March, April, May, June, July, Aug., 1916.
Glasgow & S.W.: Sept., Oct., 1916.
North Eastern: Nov., Dec., 1916; Jan., Feb., March, April, May, 1917.
South Eastern: June, July, August, 1917.
Lancashire and Yorkshire Railway: Sept., Oct. and Nov., 1917.

In December, 1917, Mr. Ahrons will deal with The London, Chatham and Dover Railway.

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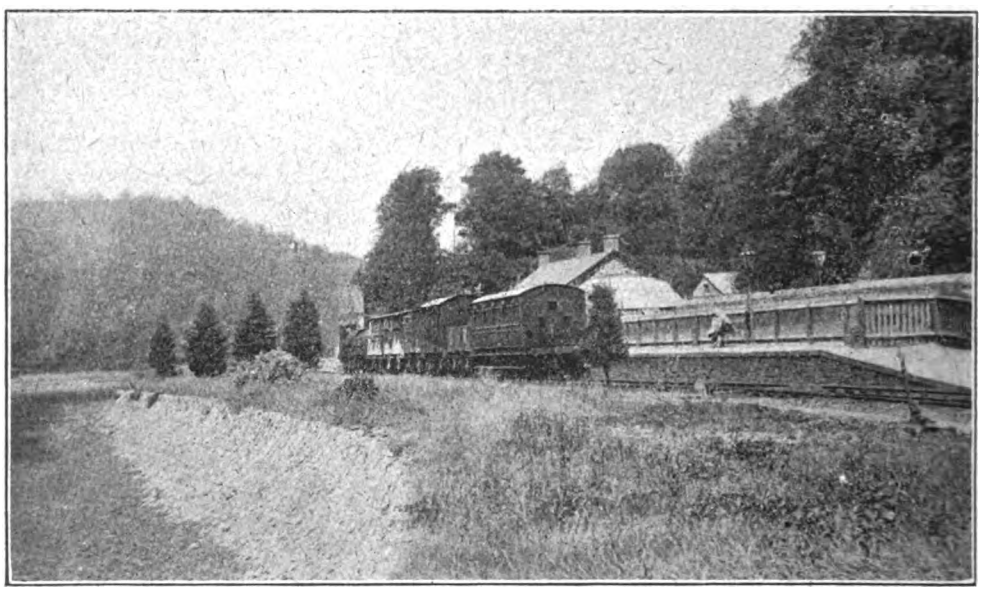
The Liskeard and Looe Railway.

By H. L. HOPWOOD.

NOTEWORTHY from many points of view is the Cornwall section of the Great Western Railway, but probably the outstanding feature of interest is its engineering work, the very difficult contour of the country having rendered necessary the construction of long and heavy gradients and many lofty viaducts. Formerly, most of the lines now comprising the Great Western Railway in Cornwall were independent systems, owing their existence to the presence of minerals in the Duchy, and the most recent of such lines to come under the control of the Great Western Railway is the Liskeard and Looe Railway, the subject of the present article. Closely associated with the Liskeard and Looe Railway in its independent state was the Liskeard and Caradon Railway: in fact the two systems might almost have been regarded as one, as they formed an end-on junction with each other, and the Liskeard and Caradon Railway worked the Liskeard and Looe Railway for many years. In 1901, however, the position was reversed, the Liskeard and Looe Railway taking over the rolling stock of the other railway and becoming the working partner. This arrangement continued until January 1st, 1909, when the Great Western Railway assumed control of both lines.

As originally constructed, the Liskeard and Looe Railway extended in a southerly direction from Moorswater, near Liskeard to the quaint and picturesque port of Looe on the south coast of Cornwall. Under the name of the Liskeard and Caradon Railway, the line continued northwards from Moorswater to the granite quarries at Cheesewring, taking a somewhat circuitous course between those points and tapping *en route* the copper mines at Caradon. Of the two railways, the Liskeard and Caradon was the older, having been opened in March, 1846, from Liskeard to Caradon, whilst at a later date it absorbed the Kilmar Railway, the



Photo] [*Locomotive Publishing Co., Ltd.*

GREAT WESTERN RAILWAY MIXED TRAIN IN LOOE STATION.
Great Western Railway 4-4-0 engine, No. 13.

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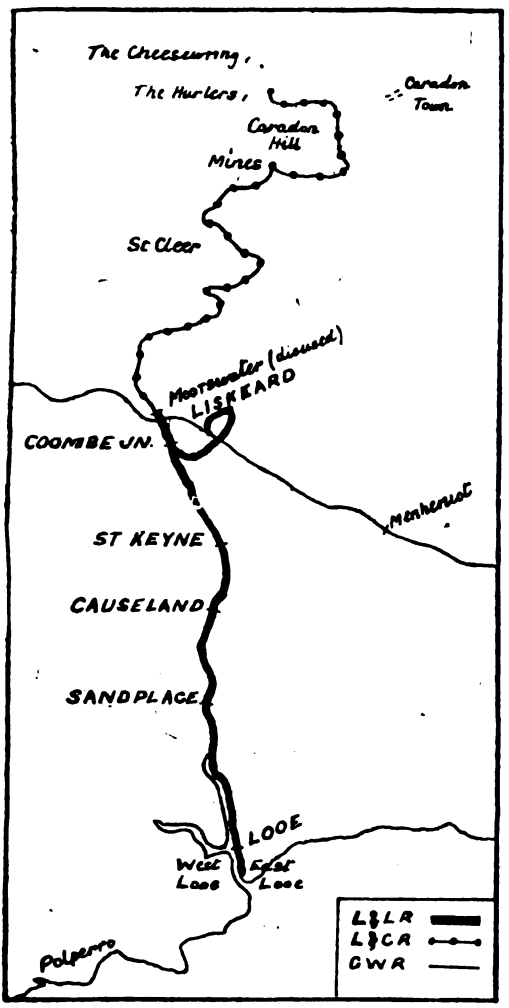
property of the Cheesewring Granite Company. Between Liskeard and Looe a canal had existed since 1828, and when the Caradon line was opened its terminus at Liskeard was in close proximity to the canal, so that the traffic—granite from Cheesewring Quarries and copper from Caradon mines—might easily be transferred from the railway wagons to the canal barges and taken to



Looe for shipment. The growing requirements of the port of Looe demanded some better means of communication than by a canal, and—as is inevitably the case—the canal eventually had to give way to the railway, the Liskeard and Looe Railway being opened in 1859 and forming what was really a southern extension of the Liskeard and Caradon Railway.

A passenger service was started on the Looe Railway in 1878, trains running between Moorswater station, Liskeard and Looe. Officially, the Caradon line conveyed minerals only, but passengers were also carried at their own risk in open wagons. Free passes were issued, but a charge was made for a passenger's stick, umbrella or parcel, as the case might be. The practice of thus carrying passengers was abolished about 1896, and thereafter the Caradon Railway conveyed only mineral traffic.

For many years the two railways were entirely isolated from any other, but in 1901 physical connection was made with the Great Western Railway by means of a very curious junction at Liskeard. Previous to 1901 the combined mileage of the Looe and Caradon lines was 17¾ miles. The "splendid isolation" of the two systems, together with the fact that the output of copper from Caradon mines in recent years had become almost nil, made matters serious: in fact, so long ago as 1886 a Receiver had been appointed to manage the affairs of the Caradon Railway. Although Moorswater station was only ¾ mile by road from Liskeard station on the Great Western Railway, the latter company made no reference to the Looe line in their time-tables, but instead, advertised a service of road vehicles that plied between Menheniot station and Looe. In order to bring an increase of traffic to the two railways, a connection to the Liskeard station of the Great Western Railway was decided upon, and the work was duly carried out, the line being opened on May 15th, 1901. To appreciate the difficulty of the undertaking, reference should be made to the accompanying map, from which it will be seen that the Great Western Railway crosses the Liskeard and Looe Railway at right angles by means of the Moorswater viaduct, the maximum height of which is 154 ft. The new line left the Looe Railway at Coombe Junction and described almost a complete circle on a rising gradient of 1 in 35 and passed *en route* under the Liskeard viaduct immediately east of the station of that name. The new station at Liskeard was at right angles to the Great Western station and a junction was also put in for the working of through traffic. The length of the new line was 2 miles 5 chains, and owing to the difficulties of construction, the cost was not less than £35,000. The opening of this extension immediately led to a great increase of traffic, for whereas in 1900 only 21,000 passengers were conveyed on the

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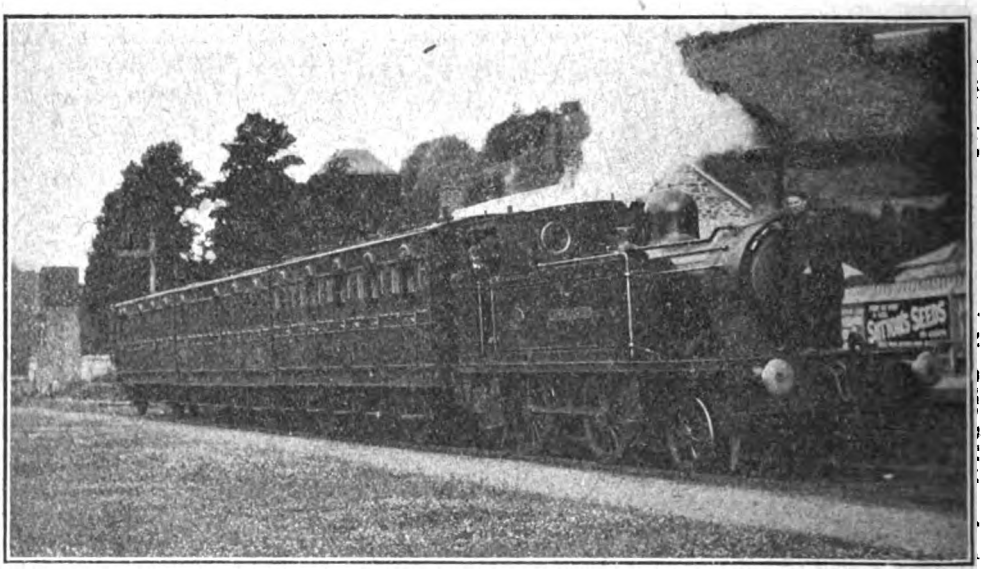
Liskeard and Looe Railway, their number had increased by 1908 to 70,798. Upon the opening of the new line, Moorswater station, the former terminus for passenger traffic, fell into disuse. A week previously the rolling stock of the Caradon Railway was transferred to the Liskeard and Looe Railway, who thereafter worked the traffic of both lines until the end of 1908.

It was not until the early 'sixties that the Liskeard and Caradon Railway possessed a locomotive, traffic having previously been worked by horses. The first engine, *Caradon*, was a 0–6–0 saddle tank with outside cylinders, but we are unable to give any particulars of it. From photographic evidence it appears to have been rebuilt at one period with a modern boiler. This engine was broken up in 1907.*

A second engine supplied in 1864 was also a 0–6–0 saddle tank. It was named *Cheesewring*, and was built by Hopkins, Gilkes & Co., of Middlesbrough, and was followed in 1869 by a sister engine, *Kilmar*, from the works of the same firm. The illustration of *Kilmar* (page 319) shows the engine standing with a train of original coaches at the now disused Moorswater station. It will be seen that the third pair of coupled wheels are the drivers—a rather unusual arrangement, as is also that of the dome, which is located on the last ring of the boiler barrel, although from the picture it might be assumed that the dome was placed on the firebox. *Cheesewring* was reboilered in 1890 with the dome on the centre of the barrel, but otherwise the engine was unaltered. In the case of *Kilmar*, this engine retained its old boiler, but subsequently a cab replaced the original weatherboard. Both engines were built to the following dimensions :—

Cylinders	13 in. by 24 in.
Diameter of wheels	4 ft.
Boiler, length	11 ft. 7½ in.
,, diameter inside	3 ft. 3 in.
Heating surface	692·72 sq. ft.
Grate area	10½ sq. ft.
Working pressure	140 lbs.
Tank capacity	750 galls.



Photo] [*Locomotive Publishing Co., Ltd.*

LISKEARD AND LOOE RAILWAY.

2–4–0 engine, *Lady Margaret*, at Looe station, with a train of coaches formerly owned by the Mersey Railway.

In 1901 a fourth engine, *Looe*, made its appearance from the works of R. Stephenson & Co. This was one of the makers' standard pattern of 0–6–0 outside cylinder saddle tank engines, cylinders being 16 in. by 20 in., and coupled wheels 3 ft. 6 in. in diameter, whilst the wheelbase was only 8 ft. Not being found suitable to local requirements, this engine was sold in 1902 to the London and India Docks Joint Committee (now the Port of London Authority).

* If any reader possesses details regarding the engine *Caradon*, the Editor will be pleased to hear from him.

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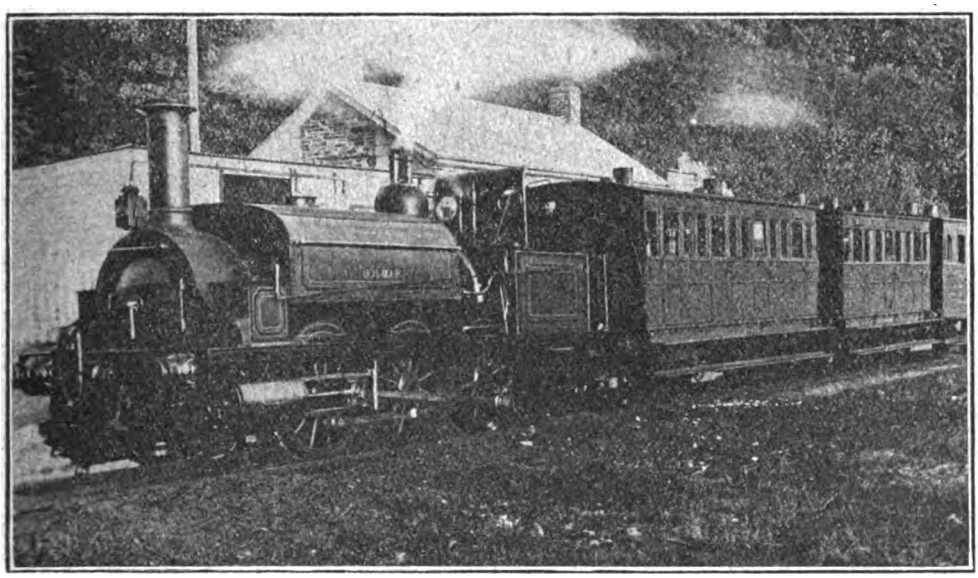
To replace the *Caradon*, which it will be remembered was broken up in 1907, Messrs. A. Barclay & Co., of Kilmarnock, supplied a 2–4–0 side tank engine named *Lady Margaret*. This engine has cylinders 14½ in. by 22 in. and coupled wheels 4 ft. in diameter. Heating surface is 650½ sq. ft., grate area 11·6 sq. ft., and working pressure 160 lbs. With 650 gallons of water in the tanks the engine totals 28 tons. After 1901 a Great Western engine occasionally made its appearance on the line, being hired to replace a Liskeard and Looe engine when the latter was under repair. No. 13, a 4–4–0 saddle tank engine of the Great Western Railway was usually allotted this duty.

Our first journey over the railway was made in July, 1908, six months previous to the line being taken over by the Great Western Railway. At that time the permanent way was of four distinct types. Between Liskeard and Coombe it was formed of modern bull-headed rails, but on the original portion of the line there were stretches laid with flat bottomed rails secured to sleepers without chairs, alternating with lengths of bridge rails on longitudinal timbers; whilst in many places much of the original form of permanent way laid on granite blocks still survived. The latter was in use in 1911 and some of it may possibly remain to-day. The line was—and still is—single throughout its length, with a crossing place at Coombe Junction.



Photo] [*Locomotive Publishing Co., Ltd.*

LISKEARD AND LOOE RAILWAY.

0–6–0 engine, *Kilmar*, and train of old coaches at Moorswater station.

The running shed and repair shops were at Moorswater, power for driving the shop machinery being obtained by means of a water wheel. When the Great Western Railway took over the working of the Liskeard and Looe Railway in 1909, the three surviving engines passed into Great Western stock and were numbered as follows:—

Name.	G.W.R. No.
Lady Margaret	1308
Cheesewring	1311
Kilmar	1312

The original carriage stock numbered four four-wheeled vehicles, *viz.*, a three-compartment first, second and third composite, a four-compartment third and two brake vans, which were all built between 1878 and 1880. In 1901 there were supplied some new carriages of the open saloon type with end doors and carried on four-wheeled bogies, but they did not long remain in service, being replaced by some four-wheelers purchased from the Mersey Railway. Wagons for mineral and goods traffic numbered about 50. They were of 6 tons capacity and were provided with footboards and screw-down brakes, the latter being operated by means of a handle on a vertical shaft.

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At the four intermediate stations the guard issues tickets.

Looe, besides being an attractive seaside resort of the quieter order, is an ancient and busy little port and one of the principal fishing centres of Cornwall. There are really two towns, East Looe and West Looe, which are joined by a stone bridge across the harbour. Looe is one of the most noted beauty spots in Cornwall and in situation is very like Fowey and Falmouth, there being the same narrow entrance to the land locked harbour, the waters of which penetrate inland between high hills for some miles. Beyond the bridge the waters divide to form the East Looe and West Looe rivers and the steep and well-wooded slopes present an indelible picture of great beauty. The station is built on the waterside at the junction of the two rivers, and the line, which commences at the harbour, follows the East Looe river as far as Moorswater, where the now disused station is situated almost under the Moorswater viaduct of the Great Western Railway.

At the northern end of the line are Caradon Hill and the Cheesewring. From the summit of Caradon (1,213 ft.) extensive views of Dartmoor are obtained, and on a clear day both the English Channel and Bristol Channel can be discerned. The country is wild and rugged, huge boulders of granite dominating the scene, and here, as elsewhere, ruined engine houses and chimney shafts tell a tragic tale of Cornwall's once prosperous mining industry. The curiously named Cheesewring is a pile of blue grey granite boulders, the larger stones, 34 ft. in circumference, being poised on smaller ones. They have maintained their balance from time immemorial. In the vicinity of the Cheesewring are the Hurlers, dating from prehistoric times and being the remains of three large Circles. The railway between Caradon and Cheesewring makes a wide detour round the base of Caradon Hill. Since the time when passengers ceased to be conveyed north of Moorswater, the Cheesewring and other places of interest in the neighbourhood have been accessible to the tourist only by road, Liskeard being the best centre from which to work. In 1908, the last year of independent existence of the Liskeard and Looe Railway, the summer train service consisted of seven regular trains from Liskeard and an additional one on three days of the week. From Looe there were six trains, an extra one also running on four days of the week. At Coombe it is necessary for all passenger trains to reverse, as the junction unavoidably faces in the wrong direction for through working.

From January 1st, 1909, the Great Western Railway commenced to work the line at a percentage varying from 72 to 66 per cent. of gross receipts, with a minimum payment of £1,200 per annum to the Liskeard and Looe Railway. Under Great Western control the line remains much the same as it did previously, but at present the train service is necessarily somewhat restricted owing to the war. For the same reason the Caradon mineral branch has been temporarily closed since January 1st, 1917.

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Ambulance Work on the South Eastern and Chatham Railway.

ON this line First Aid work among the staff has for a long course of years received much encouragement from the directors and officers of the Company. The South Eastern and Chatham Railway was constituted a centre of the St. John Ambulance Association in 1905, although, previous to this date, classes were organised throughout the system, and the foundation laid for the excellent results herein recorded.

The railway is divided into nine districts, each district having its own Secretary and Committee.

During the past season, 289 first year certificates have been issued to new members, whilst nearly a thousand members of the staff, already holding an award of the Association have successfully passed a more advanced examination.

In 1910 a medal of special design was instituted for presentation to members passing an ambulance examination seven years in succession. Since then no less than 701 men have qualified in this manner. The medal is a much coveted distinction, and is undoubtedly the means of ensuring that members of the staff will keep themselves proficient in first-aid knowledge and attend annually for re-examination. It is also a tangible evidence of the fact that the holder is absolutely competent to deal with any case of accident or sudden illness with which he may be brought into contact.

The following figures represent the awards issued to successful members of the classes since the formation of the centre :—

	Voucher.		Medal.	Label.	
Year.	1st exam.	2nd exam.	3rd exam.	4th and subsequent exams.	Total.
1906	408	145	86	93	732
1907	267	295	134	179	875
1908	274	201	257	302	1,034
1909	360	217	185	480	1,242
1910	240	218	191	594	1,243
1911	316	183	206	723	1,428
1912	232	199	142	810	1,383
1913	163	119	154	798	1,234
1914	148	113	86	817	1,164
1915	222	83	74	780	1,159
1916	231	81	55	822	1,189
1917	289	129	92	873	1,373

It will thus be seen that the number of first certificates granted during the past season has been greater than for several years past, whilst the total number of awards compares favourably with previous years, especially bearing in mind that, owing to the exceptional conditions prevailing, it has been found impossible to hold the usual competitions and demonstrations, and that this undoubted stimulus has, therefore, been wanting.

With the advent of female labour on the railway, classes have been held for women members of the staff in various districts. These classes have been well attended, and a high percentage of successes gained at the examinations.

Of South Eastern and Chatham Railway employees serving with the Colours at the present time, 230 are members of the centre. A successful First Aid Class for members of the staff attached to the Railway Operating Division at Boulogne has been held under the auspices of this centre, and the many reports of first aid rendered by the members prove the value of the knowledge gained.

First aid has been rendered by members of the staff in 4,114 cases during the past twelve months, making a total of 32,000 instances where the patients' sufferings have been alleviated and further complications prevented since the formation of the centre in 1905. These figures speak for themselves.

Since the outbreak of war, all ambulance trains conveying patients to five hospitals on the South Eastern and Chatham Railway have been entirely unloaded by the railway's ambulance employees.

This work has been performed by the members of the staff in the districts affected, and has been carried out in the men's own time at all hours of the day and night, necessitating a great deal of self-sacrifice. The men, however, who, by the bye, have individually purchased their own uniform and equipment, are glad to realise that, all unconsciously, the knowledge gained by them in the past has been but a preparation for the time when they would be able to ensure the comfort of those broke in our wars whose lot it has been to be drafted to hospitals

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situated on the South Eastern and Chatham Railway Company's system.

The practical interest taken in the ambulance movement by the staff generally is evidenced by the action of the Stationmasters, Inspectors, and Locomotive Foremen who have combined for the purpose of instituting a fund, which has been subscribed to by all grades of the service, for presenting prizes to ambulance men performing meritorious acts of first aid, and by other means encouraging the staff to take up the work. The subscriptions this year amount to no less than £97—twice the amount received on any previous occasion. With this sum a magnificent shield has been purchased for annual competition by teams of men throughout the railway, £35 has been distributed amongst the various corps, and in the purchase of surgical aid letters for the benefit of ambulance men and their families, and the remainder for the purchase of prizes.

MR. ERNEST A. RICHARDS.

Chairman of South Eastern and Chatham Railway Centre Committee of the St. John Ambulance Association.

The action of the Stationmasters, Inspectors, and Locomotive Foremen in connection with the fund is greatly appreciated, and there is not the least doubt that it is a means of encouraging the staff to take up the first aid work. On no other line, so far as is known, is a fund of this kind in existence.

It is worthy of record that, by means of collections, the proceeds of concerts, etc., etc., the members of the South Eastern and Chatham Railway centre have been enabled to subscribe the sum of over £100 to the funds of the St. John Ambulance Brigade Hospital, acknowledged to be one of the best, if not the best, equipped, hospital in France, thus showing their interest in the work of the Order of St. John over-seas as well as at home.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.

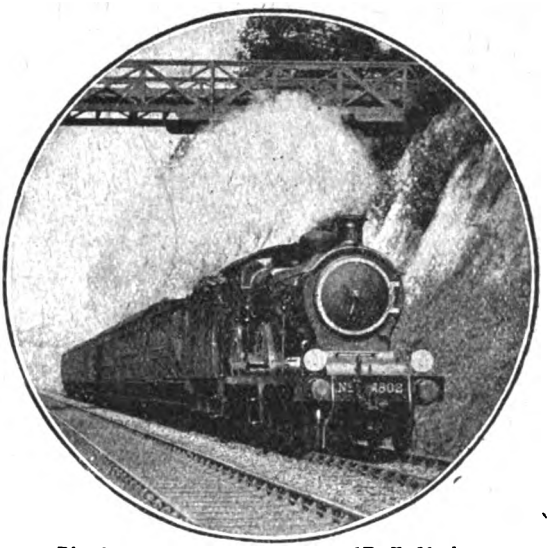

Photo [*F. E. Mackay.*

GREAT EASTERN RAILWAY.

Up St. Pancras express passing Audley End.

QY October article, as readers may remember, contained the beginning of a discussion on compound *v.* simple locomotive propulsion, arising out of a correspondent's letter which cited some notable performances on the part of compound locomotives described by the late Mr. Charles Rous-Marten in bygone pages of the RAILWAY MAGAZINE. Mr. Rous-Marten remarked of these runs that he still awaited "the accomplishment of the like performance by any other locomotive of any other type," and that he would be "only too delighted to have the opportunity of recording it if achieved." To these details I added those of recent tests of "Pacific" compound locomotives on the Paris, Lyons and Mediterranean Railway of France, together with certain feats timed by Lord Monkswell and myself behind the compound 4–6–2 express engines of the Nord Company. The article then concluded with the description of a series of journeys on the Great Western Railway of this country, as illustrating some of the best that the British Isles can produce in the way of locomotive work with non-compound locomotives. But in the present article I want to carry the comparison on in an altogether more detailed manner.

Let us first of all consider the exceptional figures of Mr. Charles Rous-Marten, mentioned above. The only one of them which can be paralleled here without difficulty, and even surpassed, is that wherein a Nord compound "Atlantic" maintained 75 m.p.h. along a dead level with 305 tons behind the tender. My own highest dead level record is with a 4–4–0 simple engine of Class R on the North Eastern Railway, which, when hauling the so-called "Fastest Train in the British Empire"—44½ miles between Darlington and York in 43 min., start-to-stop—ran for 4 miles on end between Tollerton and Beningbrough at 80·3 m.p.h. But the load was very light, totalling as it did only 150 tons behind the tender, or one-half that of the French engine. On the same train one of the 3-cylinder superheater "Atlantics" maintained 78·9 m.p.h. on the same stretch with the slightly heavier load of 165 tons. Closely approaching this I have a record of 77·5 m.p.h. behind one of the old North Eastern 7 ft. 7 in. bogie "singles" of class J, on the level track of the Scarborough branch near Ganton, but here the load was a mere featherweight of 80 tons.

On the Great Western Railway, however, one of the journeys described last month supplies a rival to this particular claim, in that the 2-cylinder 4–6–0 *Lady of Provence* maintained 75 m.p.h. on the level through Slough with 310 tons behind the tender—a feat that I had recorded on two previous occasions with 270 and 250 tons respectively of train-load. Still more remarkable, perhaps, was *Lady of Provence's* feat in attaining a maximum of 80 m.p.h. at Didcot with the mere assistance of a down grade at 1 in 754, when the train-load totalled 345 tons. Then the down journeys must not be forgotten, as with a load of 380 tons *Rising Star* maintained 69 m.p.h. unwaveringly for 15 miles, while on my last run on the same train, with

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no less than 420 tons behind the tender, *Knight Templar* maintained exactly the same speed from Reading to Goring troughs. All the performances cited in this paragraph, and also the 80 m.p.h. record of the last paragraph (the weight and power of the engine in that case being duly considered) are fully comparable to the feat of the French compound on a level track as mentioned by Mr. Rous-Marten.

But when we come to the uphill records of the French compounds parallels are not so easy to find. The three "Atlantic" records which Mr. Rous-Marten mentioned, all achieved up the sustained 1 in 200 grades in which the Nord system abounds, were (1) attaining 75 m.p.h. with 156 tons from a dead stand on the grade, (2) attaining 75 m.p.h. with 170 tons from a "flying" start, and (3) maintaining 62·1 m.p.h. with 309 tons up 13 miles of the grade continuously. To these I would add Lord Monkswell's experience with a Nord "Pacific" on the 1 in 200 of Survilliers ascent, which engine, hauling a load of 292 tons, attained 67¾ m.p.h. on the grade and maintained an average of 64·1 from the foot to the summit. Similarly on my own run behind one of the same engines, with 405 tons, the average speed was 56·2 m.p.h., and the highest rate 57¾ m.p.h.

Now there are only three British lines on which long stretches of 1 in 200 grade, or something closely approaching it, are to be found. They are the Great Northern, the Midland and the Great Central. But I am afraid that my records on all three of them come altogether short of the figures quoted above. On the Great Central Railway, up the slightly steeper grade of 1 in 176, I have noted the maintenance of 61·6 m.p.h. continuously, on two succeeding banks, with 175 tons. The engine in this case was a 4–4–0—of the superheater "Director" class—and I happen to know that she was not being worked in anything like full gear, neither was the regulator fully open. On the Midland Railway in pre-war days I have seldom recorded speeds much above 50 m.p.h. at the summit of 1 in 200 grades, such as those culminating at Ampthill and Toddington on the south-bound journey, with average loads of 200 to 220 tons. But here again only 4–4–0 engines are employed.

Photo [*Alasdair Maclean.*

CALEDONIAN RAILWAY.

4–6–0 outside cylinder superheater express locomotive, No. 62.

The Great Northern Railway, as is well-known, is not generally addicted to high speeds uphill. When the large-boilered "Atlantics" were first introduced, No. 251—the pioneer—had some remarkable feats to her credit on the long ascent from Tallington to Stoke. With 248 tons behind the tender (exclusive of passengers and luggage) she covered the 11½ miles in 11 min. 40 sec., maintaining the mile-a-minute rate on both the 1 in 200 before Corby and the final 3 miles at 1 in 178. On a subsequent occasion this performance was bettered, as with 265 tons (also tare load) the time was exactly 11 min., the average rate from bottom to top being 62·5 m.p.h., and the absolute minimum 60 m.p.h. There is not a great difference between the last-mentioned achievement and No. 3 of those cited by Mr. Rous-Marten, as with passengers and luggage the 265-ton load would probably have swollen to 280 tons, at the least, or 29 tons only under that of the French engine, while the maintained speed was almost exactly similar up a bank slightly easier in commencement and slightly steeper at the finish.

At the same time it would be idle to contend that this running is representative of *average* Great Northern work uphill. The nearest that I ever approached to the figures was a time of 12 min. 5 sec. with 265 tons gross, on the 5.30 p.m. *ex*-King's Cross,

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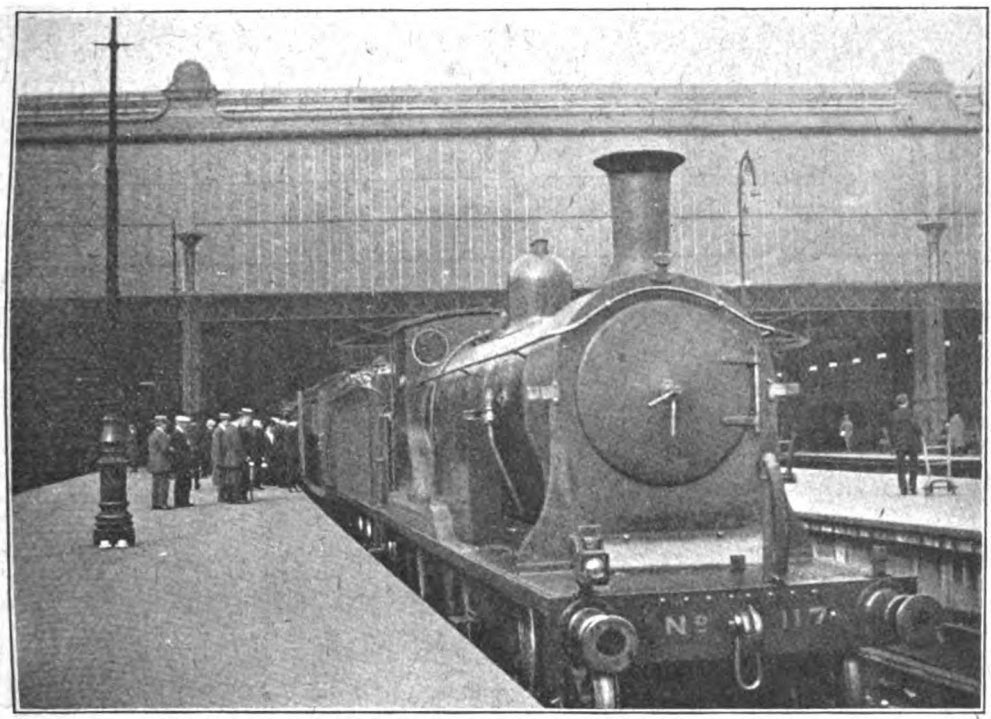
which, while certainly a fine piece of work, falls appreciably short of the records quoted. Some figures which I got out some time ago relative to Potters Bar bank—8 miles at 1 in 200—showed that the non-superheater "Atlantics" averaged 43·7 m.p.h. when passing Potters Bar with 270 tons behind the tender, and 39·8 m.p.h. with 335 tons, while the superheater engines, then in their infancy, averaged 44·2 m.p.h. with 290 tons. These are in all cases minimum speeds, timed on a very large number of occasions. Since loads have expanded to their present



Photo] [*F. H. Stingemore.*

LONDON AND SOUTH WESTERN RAILWAY.

3.25 p.m. West of England express train at Waterloo.
6 ft. 7 in. 4–4–0 locomotive, No. 117. Engine has only just backed on to train, hence tail lamp on buffer beam.

dimensions the occasions have been very few indeed, even with the superheater engines, that I have recorded a final speed of 40 m.p.h. or over with any load in excess of 400 tons.

Now it is obvious that such figures are not to be compared with the high averages maintained by the Nord "Pacifics" on the similar grade—in my case 56·2 m.p.h. average and 54 absolute minimum, with a load of 405 tons. At the same time the governing factors in the Great Northern case must be considered. In the first instance, and most important, the end-to-end schedules have not demanded exceptionally high uphill speeds, even if the engines were able to maintain them, while the temptation to make the most possible use of long down-grades, with no restrictions on maximum speeds, such as exists in France, is also a deterrent to over-exertion on adverse gradients. Admittedly certain of the point-to-point times in the Great Northern working time-tables, as King's Cross to Hitchin in 23 min., would call for energetic uphill work, but the observance of these never seems to have been enforced with any rigour. That being so, it is hardly to be expected that drivers will go out of their way to thrash their engines unduly uphill, increasing both wear and tear and the consumption of fuel, while inviting trouble with tubes and stays when the engine is "eased" after the top of the bank, owing to the reduced rate of fuel combustion causing a fall of temperature in the firebox and occasioning leakage.

On the Great Northern Railway, also, the matter is complicated in the case of down

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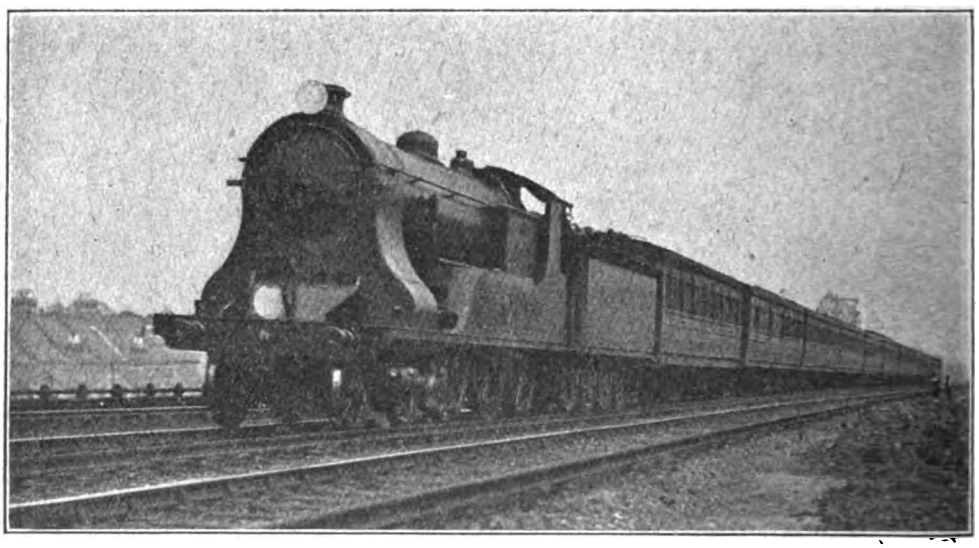
long-distance trains leaving the terminus by the fact that there is no possibility of taking water until Werrington troughs are reached, 80 miles from London. With the limited water capacity of the tender this necessitates a careful conservation of the water supply in the early stages of the journey, if the train-loads are heavy.

The same remark as to schedules applies to such a speed as 75 m.p.h. up a 1 in 200 grade, and one would be in the highest degree unlikely to record such a speed here unless it were on an experimental run, although I certainly believe, from uphill performances that I have recorded, that there are engines in this country which could do it, with such trifling loads as 156 or 170 tons behind the tender. For instance, the pioneer "Claughton" class 4-cylinder 4–6–0 superheater engine of the London and North Western Railway—No. 2222, *Sir Gilbert Claughton*—starting from Oxenholme with 310 tons behind the tender (all but twice the load of 156 tons mentioned above, when 75 m.p.h. was attained from a dead start on a 1 in 200 grade) managed to reach a speed of 47·9 m.p.h. on the 7 miles' ascent to Grayrigg summit. Now the actual start for ¾-mile is on 1 in 182; then follow ¾-mile at 1 in 106, a mile at 1 in 120, 2½ at 1 in 133 (on which the maximum rate was reached), and a final 2 miles at 1 in 106, where there was a slight fall to 46·4 m.p.h. I leave it to those who have more time at their disposal than I have to work out the theoretical horse-power developed on the two ascents.

Then, again, one of the Nord "Pacific" engines on Lord Monkswell's run ascended Caffiers bank, mostly at 1 in 125, but only 5½ miles long, with a minimum rate of 53¼ m.p.h. at the summit, starting the climb at 70 m.p.h. with 292 tons on. The other, with 287 tons, began the climb at 75 m.p.h. and finished it at 56½ m.p.h. *Sir Gilbert Claughton*, with 310 tons, began his *seven* miles' climb averaging 1 in 126 at *zero*, *attained* 48 m.p.h., and *maintained* 46½ on the steep two concluding miles at 1 in 106. To me there seems nothing at all to choose between the two respective performances. Or let us consider the ascent of Gannes bank, on the 1 in 265 section of which the "Pacific" with 292 tons maintained 64 m.p.h., increasing this to 69 m.p.h. on the final 4 miles at 1 in 310. Now on the sustained 1 in 330 of the London and North Western Railway up to Tring, I have with a 4–4–0 "George the Fifth" class engine and no less than 410 tons timed a minimum speed, well sustained, of 56·3 m.p.h. The "Pacific" weighs 90 tons, and was therefore hauling a train-load of 3·24 times its own weight, whereas the British 4–4–0 was hauling no less than 6·83



Photo] [*F. E. Mackay.*

LONDON AND SOUTH WESTERN RAILWAY.

Plymouth luncheon car express passing Earlsfield.
6 ft. 7 in. 4-cylinder 4–6–0 locomotive, No. 444.

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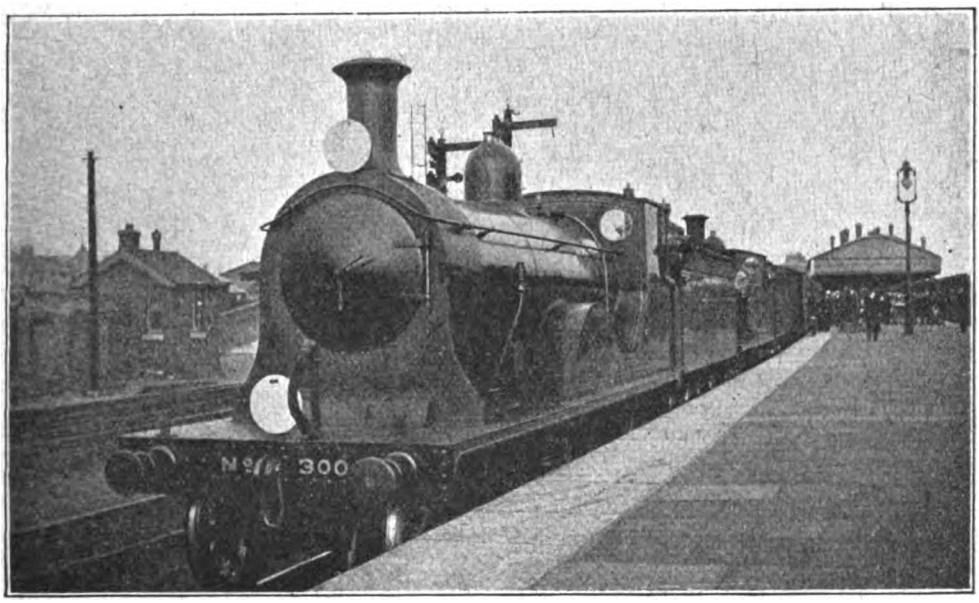
times its own weight, or more than double the proportion in the case of the French engine, but on a slightly easier grade.

The Great Western Railway is a line to which one would turn naturally for achievements in the matter of hill-climbing, but it is most difficult to bring into the comparison in view of the fact that there are so few smooth stretches of grade which can be cited as parallels to the French sections named. In one of the runs described last month a 4-cylinder 4–6–0, hauling 360 tons, covered the 16·8 miles from Lavington to Savernake, almost continually ascending, in 16 min. 23 sec., commencing 6 miles of 1 in 222 at 68 m.p.h. and falling to 56, while 3¾ subsequent miles averaging 1 in 240 and ¾ at 1 in 153, only reduced the rate from 67 to 60 m.p.h. With no less than 525 tons behind the tender, I have recorded a time of exactly 20 min. for the same length of line, speed falling from 60 to 45 m.p.h. on the 1 in 222 bank, and from 59·2 to 47·9 m.p.h. on the final incline. Here we have loads totalling respectively 4·72 and 6·95 times the weight of the engine concerned, against the 3·24 of the French compound in the ascent of Gannes bank, and the Great Western ascent in this case is decidedly the steeper of the two. On analysis, therefore, it is open to question whether we cannot, on occasion, produce locomotive work over here which very closely approaches that of the Frenchc ompounds, all circumstances considered, although it must be admitted that the average work on the Northern line transcended anything that we did normally over here—indeed, the Nord bookings demanded it.

Hitherto we have merely compared—and very inconclusively, I fear—the work of French compound locomotives with British simple engines, without touching on the economic side of compound *v.* simple propulsion, but I fear that considerations of space compel me now to hold this part of the discussion over till next month and to pass straight on to performance. It has been a great pleasure to me during the past summer to renew acquaintance with the London and South Western Railway. I have secured some records of the work of locomotives on that line under present conditions from London as far west as Plymouth, and the experiences thus enjoyed have proved most interesting, although perhaps I have not, on the whole, been so fortunate as at other times in the matter of securing really noteworthy journeys. This partly arises, however, out of the fact that the working of the mid-day expresses



Photo] [*F. H. Stingemore.*

LONDON AND SOUTH WESTERN RAILWAY.
3.25 p.m. from Waterloo at Salisbury.
4–4–0 engines, Nos. 300 and 724.

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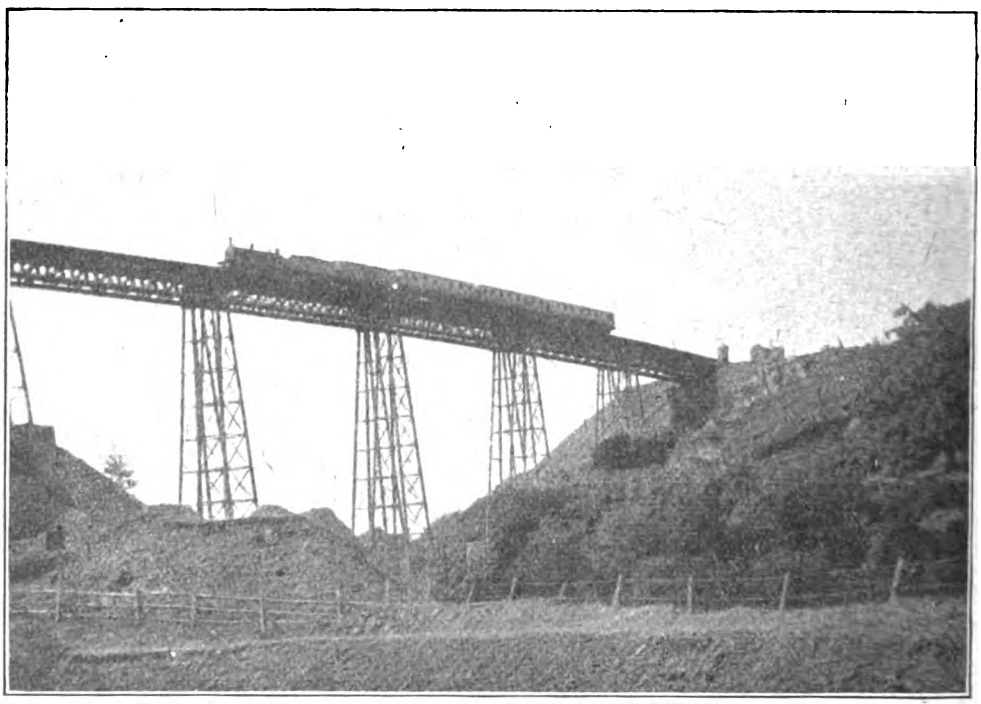
between London, Exeter and Plymouth has been considerably modified during the past summer.

A relief express to the 11.0 a.m. *ex*-Waterloo has run non-stop from Salisbury to Exeter, with passengers off the Portsmouth, Southampton and other connecting trains, and has taken up the working from Exeter of the fast Plymouth portion hitherto run off the London train. During the season the first portion of the London express, leaving at 11 a.m., has been run to Ilfracombe, while a second portion, at 11.10 a.m., has served North Cornwall and Sidmouth, a allowed to Salisbury, and 89 min. thence to Sidmouth Junction, so reaching Exeter at 2.35 p.m.—a total increase of 7 min. in journey time. Similar arrangements were made with the up mid-day trains, the Ilfracombe portion leaving Exeter at 11.55 a.m., and picking up the Sidmouth coaches, while the Plymouth portion left Exeter 10 min. later than previously—at 12.10 noon—ran non-stop to Salisbury in the moderate time of 103 min., and thence, picking up a substantial slow portion from Exeter, to London in 92 min. as before, arriving at 3.30 p.m.



Photo] [*J. D. Thomson.*

LONDON AND SOUTH WESTERN RAILWAY.
Exeter–Plymouth train crossing Meldon viaduct.

single composite coach for Plymouth being attached to the latter to go forward from Exeter by the "slow" at 2.53 p.m. This arrangement was all the more curious in that the 11.0 a.m. from London was at one time a Plymouth express pure and simple, whereas during the past summer it has practically not connected with Plymouth at all unless an arrival at North Road at 5.14 p.m.—a solid hour after the corresponding train from Paddington—be deemed a connection. Opportunity was taken temporarily to decelerate all these trains, the 11.10 a.m. down, by which I travelled, having 94 min.

In the down direction I had one run on the 11.10 a.m. to Exeter, and one on the 3.25 p.m.—a train practically unaltered save for the additional stop at Woking, for which 5 min. has been allowed. On the former journey we had a substantial train of eleven corridor 8-wheelers, including restaurant-car, 306 tons empty and 325 tons full. While mentioning the restaurant-car, I cannot refrain from congratulating Messrs. Spiers and Pond, the London and South Western caterers, upon their admirable lunch, served at pre-war price and with very little to distinguish it from pre-war fare. Our engine

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was No. 443, a Drummond 6 ft. 7 in. 4-cylinder 4–6–0, now equipped by Mr. R. W. Urie with the Eastleigh superheater. Adherence to schedule was close throughout, Clapham Junction, 3·9 miles, being passed in 7 min. 50 sec.; Hampton Court Junction, 13·4 miles, in 19 min.; Weybridge, 19·2 miles, in 24¾ min.; Woking, 24·4 miles, in exactly half-an-hour; and mile-post 31 (summit) in 37 min. 55 sec. The mile-a-minute rate was first attained at Surbiton, after which speed increased to 62½ m.p.h. from Hampton Court Junction to Esher, Winchfield, 39·9 miles, 47½ min.; to Basingstoke, 47·9 miles, 56½ min.; and to Battledown, 51·1 miles, 61 min. exactly. After that we just attained 60 m.p.h. on the long 1 in 550 descent past Overton, touched 71½ at Hurstbourne, and 76½ on the sharp descent to Andover, while the 1¾ miles at 1 in 264, and 2¾ at 1 in 165 up to Grateley produced a minimum rate of 44½ m.p.h. Thus we passed Whitchurch, 59·3 miles, in 70 min. 10 sec.; Andover, 66·4 miles, in 76 min. 20 sec.; Grateley, 72·8 miles, in 82 min. 40 sec.; and reached Salisbury, after a smart

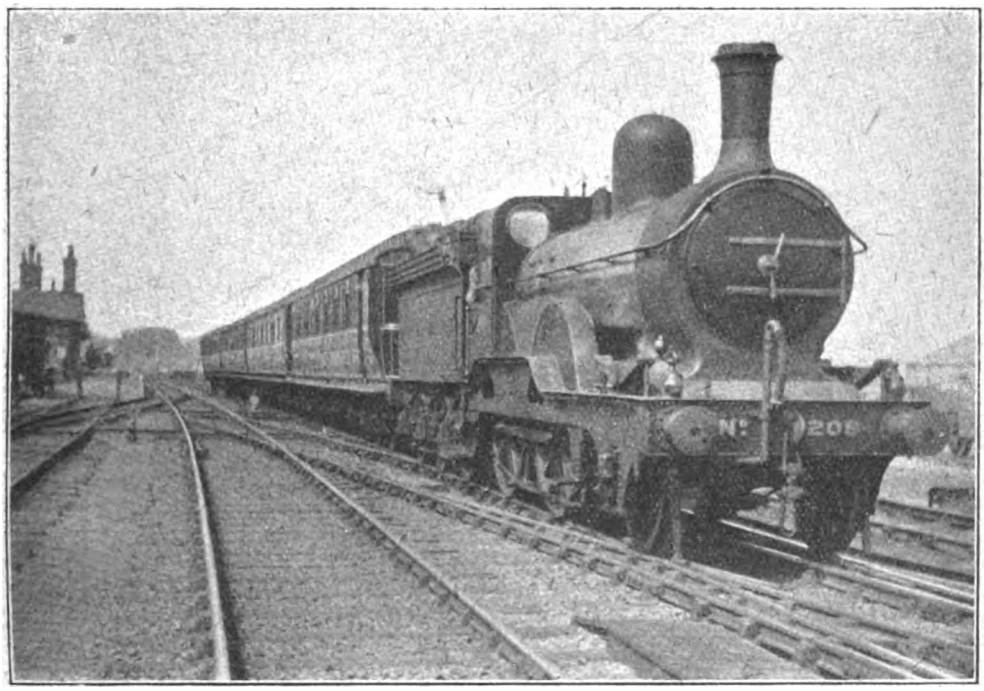

Photo [*R. Hall.*

GREAT NORTHERN RAILWAY.

Down Cambridge express.
2–4–0 locomotive, No. 209.

while a minimum of 56 at Oatlands was followed by a maximum of 64 m.p.h. at Byfleet Junction. A final minimum rate of 48½ m.p.h. was registered on the 2 miles at 1 in 298–304 which form the culmination of the 10½ miles' gradual ascent from the last-mentioned point to mile-post 31.

On the level beyond Farnborough we touched 58½ m.p.h., falling to 51 on the rise past Hook, and then, after a brief spell at 56, to 41½ m.p.h. on the 4½ miles at 1 in 249 to Battledown Junction. Our time to Farnborough, 33·3 miles, was 40 min. 25 sec.; to descent past Porton with a top speed of 79 m.p.h., in 94 min. 10 sec., running in very slowly. Thus schedule time was almost exactly kept throughout the journey.

Before proceeding westwards I may as well describe the second journey to Salisbury, on the 3.25 p.m. train, which had some notable features. The engine was the pioneer of that successful 463–472 batch of 4–4–0's, which constituted the late Mr. Dugald Drummond's final design—No. 463—now also equipped by Mr. Urie with the Eastleigh superheater, and the load ten 8-wheelers and

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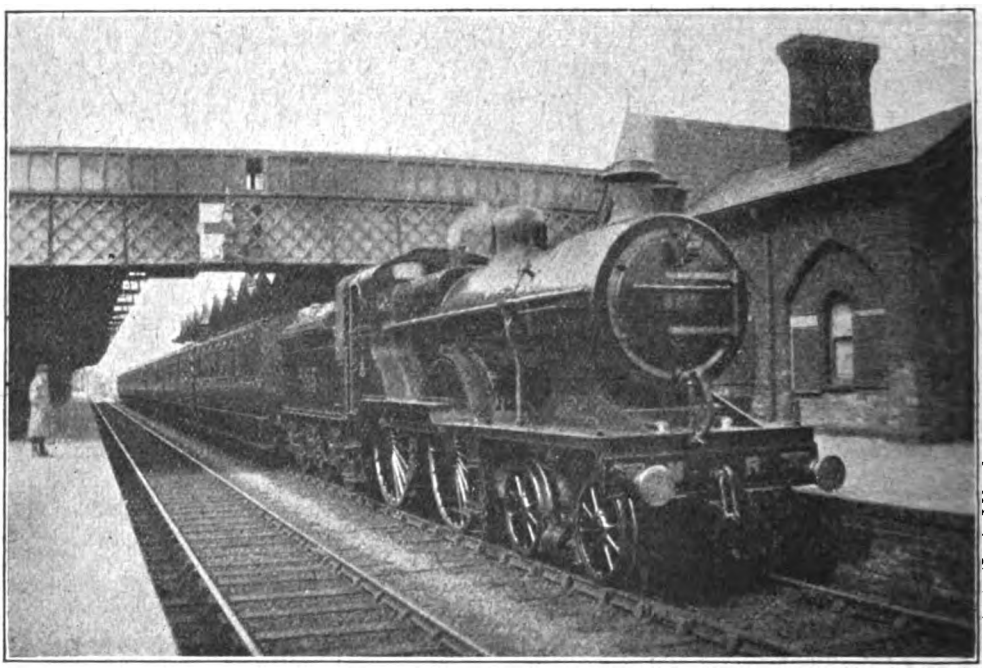
a 6-wheeler. But as these were almost entirely non-corridor coaches, the tare weight was only 246 tons, and the gross load 260 tons. In these circumstances the start from Waterloo was much more rapid than previously, Clapham Junction being passed in 7 min. 20 sec., and Hampton Court Junction in 18 min. 5 sec.; after that we were distinctly eased down, taking 25 min. 5 sec. to Weybridge, and stopping at Woking in 31 min. 40 sec. The schedule allowance is 32 min.

After a stand of 2¾ min., No. 463 did some brilliant work in re-starting up the rise to 50 sec., which was an exceedingly smart piece of work. Intermediate times were: to Farnborough, 8·9 miles, 12 min. 40 sec.; Winchfield, 15·5 miles, 19 min. 10 sec.; and Basingstoke, 23·5 miles, 27 min. 5 sec. Whitchurch, 34·9 miles, was passed in 39 min., at 65 m.p.h., but after that, as we were again before time, the engine was greatly eased, speed not rising above 69 m.p.h. at Hurstbourne, and 66 at Andover, while after we had reached a maximum of 68 at Porton the brakes were actually applied! So we took 45¾ min. to Andover (42 miles), 53 min. 10 sec. to Grateley (48·4 miles),



Photo] [*T. A. Corbett.*

MIDLAND RAILWAY.

Slow train for London in Bedford station.
Re-built superheater 4–4–0 engine, No. 555.

mile-post 31. In fact, the 6·6 miles to this point were covered in 10 min. 20 sec., speed rising to exactly 50 m.p.h. on the 1 in 326 and 314, and only falling to 48½ on the 1 in 298. At Farnborough we were doing 60 m.p.h., and beyond Fleet 64, despite the faintly rising tendency of the road, and the last-named maximum was repeated after Hook, following an intervening minimum rate of 58½ m.p.h. We passed Basingstoke at 60 m.p.h., and on the 1 in 249 to Battledown fell to 51 m.p.h., having covered the 26·7 miles from Woking, mainly uphill, in 30 min. and 65½ min. to Salisbury, 59·4 miles, thus, by this slack finish, arriving nearly a minute late. A repetition of the 4–6–0's times from Hurstbourne to Salisbury would have made our time into Salisbury 63 min. exactly, so that we could easily have gained 2 min. on schedule.

An Ealing friend sends me details of a run on the same train, with the same type of engine, in which much the same running characteristics were displayed. No. 464, also a superheater, was the engine on this occasion, with a lighter load of only 230

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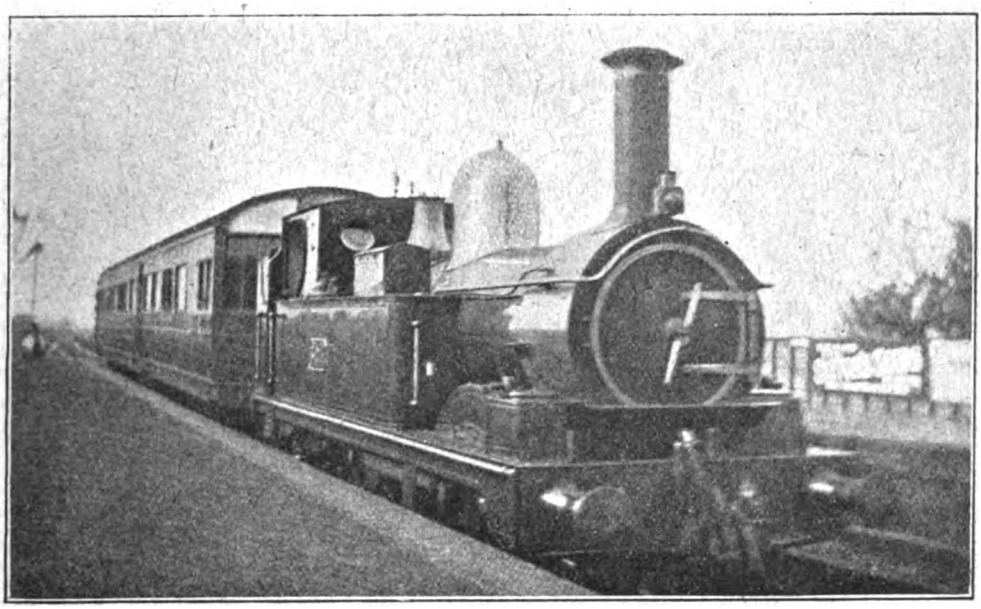
tons. From Waterloo Clapham Junction was passed in 7 min. 13 sec. and Hampton Court Junction in 17 min. 35 sec., Woking being reached in 30 min. 10 sec., or well before time. The start from Woking was not quite so smart as mine, the time to mile-post 31 being 10 min. 37 sec., and the highest speed 48 m.p.h. Farnborough was passed in 13 min. 6 sec.; Basingstoke in 28 min. 8 sec., and Battledown Junction in 32 min. 23 sec. (1½ min. over my times) at 45 m.p.h. But some very brisk work was done after that, speed rising to 75 m.p.h. at Andover and being maintained at 53 up to Grateley, so that Whitchurch was passed in 41 min. 12 sec., Andover in 47 min. 7 sec., and Grateley in 52 min. 54 sec. The 19 miles between Whitchurch and Porton were actually run in 17 min. 8 sec. But there was the same sluggish descent into Salisbury, with no higher speed than 69½ m.p.h., giving a total time of 64 min. 28 sec. from Woking. Addition of the best times on these three runs gives a time of 87 min. 38 sec. between London and Salisbury, clearly showing that these superheater 4–4–0's, if moderately loaded, could perform the journey easily in less than 87 min., assuming proportionately good work past Woking and down into Salisbury.

Onwards from Salisbury I will take my 3.25 p.m. run first, as it was by far the more interesting. By dropping the slow Salisbury–Exeter portion, and adding a couple more 8-wheelers, the load was changed to eight 8-wheelers and a 6-wheeler, 197 tons empty and 210 tons full. The engine was a small Drummond 4–4–0—No. 725—of a type which does consistently excellent work over this mountainous road when the loads are not excessive, and expectations in this case were not disappointed. A smart start was made to Wilton—5 min. 35 sec. for 2·5 miles, including a mile up at 1 in 115—and a steady acceleration to 47½ m.p.h. was registered on the rising grades beyond, while the short fall to the 90th mile-post produced a maximum of 55 m.p.h. At Tisbury a speed of 47½ m.p.h. was being maintained on constantly rising grades, while the minimum at Semley, the summit of the rise out of Salisbury, reached after 1¾ miles at 1 in 270 and 2¼ at 1 in 145, was exactly 40 m.p.h. The time to Semley, 17·6 miles, was 24 min. 25 sec. Descending to Gillingham, we touched 76½ m.p.h., and the same speed was again reached at Abbey Ford, before Templecombe, the minimum on the 2-mile rise to the 107½ mile-post (at 1 in 300–100) being 58½ m.p.h. Thus we reached Templecombe,



Photo] [*F. H. Stingemore.*

GREAT WESTERN RAILWAY.

0–4–2 tank engine, No. 524, working Southall–Brentford auto-train, at Brentford.

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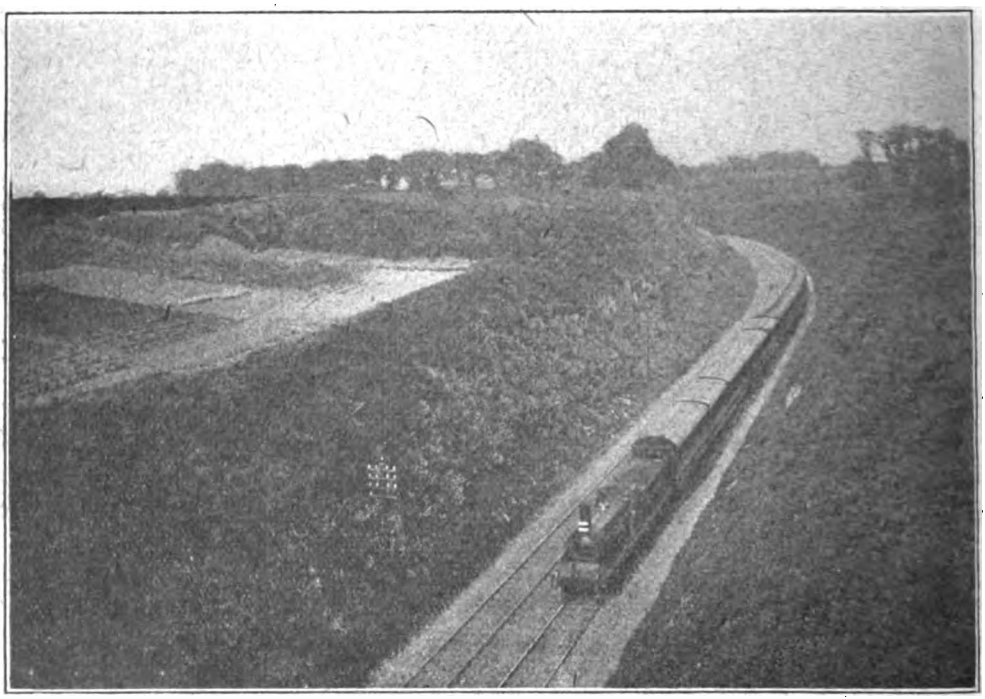
28·4 miles, in 34 min. 35 sec., or ½-min. inside schedule.

Re-starting from Templecombe, we did well to accelerate to 28½ m.p.h. on the 1½ miles at 1 in 100 to mile-post 113½, this distance of 1·3 miles being covered in 4¾ min. Then followed a swift descent to Sherborne, with a maximum of 77½ m.p.h., while at Yeovil Junction we were still doing 71½, the times from Templecombe to these two points, 6·1 and 10·7 miles distant, being 9 min. 50 sec. and 13 min. 40 sec. respectively. On Sutton Bingham bank—3¼ miles mostly at 1 in 150–140—we fell to 44 m.p.h., while the steeper ascent past Crewkerne, consisting of 2¾ miles at 1 in 80, reduced the rate to 31 m.p.h. Crewkerne, 19·5 miles, was passed in 23 min. 20 sec., and mile-post 133¼ (the summit), 21·1 miles, in 26 min. 40 sec. Most unfortunately the long descent to Axminster was spoiled by a very severe caution (on account of a small landslip) near Chard Junction, so that we did not get above a maximum of 71½ m.p.h., taking 34 min. 10 sec. to Chard Junction (27·5 miles), 39 min. to Axminster (32·8 miles) and 41 min. 55 sec. to Seaton Junction (35·9 miles).

But the ascent of Seaton bank was very fine. From the 146¼ mile-post the grade is at 1 in 100 to mile-post 147¾; 1 in 300 for ¼ mile; 1 in 80 from mile-post 148 to 150¼; 1 in 70 to 150⅝ followed by ⅛ down at 1 in 250; 1 in 80 again from mile-post 150¾ to 152⅝, and 1 in 132 through Honiton Tunnel to mile-post 153½, the summit. Yet consecutive half-miles from mile-post 149 (on the first 1 in 80 strip) were run in 49 sec., 57 sec., 59 sec., 60 sec., 61 sec., 62 sec., and 62 sec., the last mile through the tunnel taking 117 sec. Thus the engine was maintaining a steady 29 m.p.h. on the 1 in 80—a really excellent piece of work—and mile-post 153½, 41·3 miles from Templecombe, was passed in 52 min. 17 sec., or 49¼ min. net. After this all was plain sailing. We touched 83½ m.p.h. before Sidmouth Junction, fell to 66 on the short rise beyond, and then for a long distance near Broad Clyst sustained 82 m.p.h., covering the 13·9 miles from Honiton to Pinhoe in 11¼ min. Thus Sidmouth Junction, 47·4 miles, was passed in 57 min. 35 sec., and Pinhoe, 56·7 miles, in 65 min., Exeter, 59·6 miles from Templecombe, being reached in 68 min. 35 sec., or



Photo] [*F. H. Stingemore.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Up North Kent line train between Greenhithe and Dartford.

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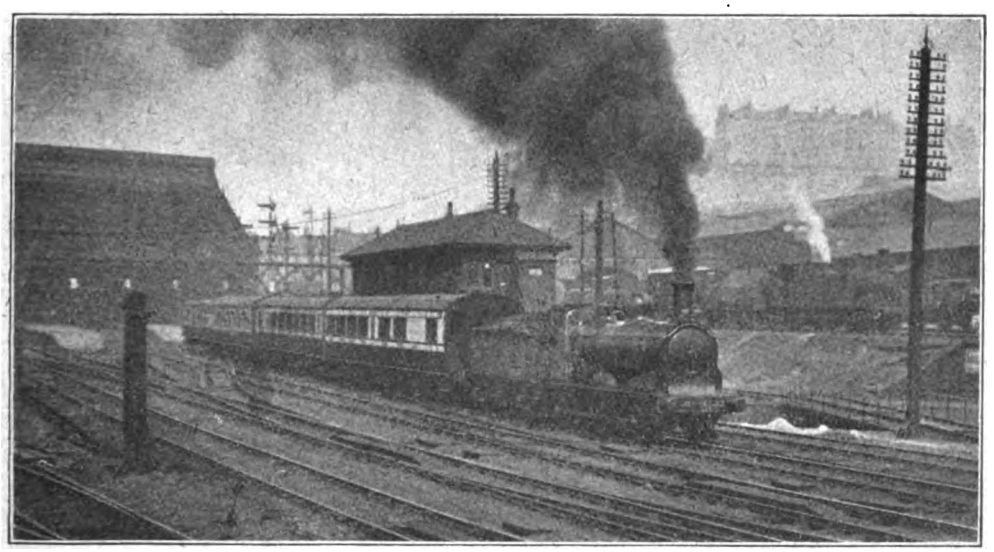
65½ min. net. Schedule time is 67 min. The work performed throughout this excellent journey was about equal to that required by the 96 min. booking between Salisbury and Exeter, and reflected credit on No. 725 and her driver.

The continuation of the run on the second portion of the 11 a.m. from Waterloo lost a good deal of its interest by reason of two bad checks *en route*. We were taken on from Salisbury by No. 459, another 6 ft. 7 in. 4-cylinder 4–6–0 now superheated, with an unchanged load of 325 tons. Starting more slowly than the 4–4–0, we took 6¼ min. to Wilton, but did better on the rising grades past Tisbury with a sustained speed of 52 m.p.h., although the minimum at Semley was again 40 m.p.h. So Semley was passed in 25 min. 5 sec., and, with a maximum of 75 m.p.h. at Gillingham, we were through Templecombe in 35 min. 20 sec. The minimum rate at mile-post 113½ was 38 m.p.h., and the maximum at Sherborne 97 m.p.h., Yeovil Junction, 39·1 miles, being passed in 46 min. 5 sec. Surmounting Sutton Bingham bank with a minimum speed of 45½ m.p.h., we accelerated rapidly on the easy grades to Crewkerne, but had the misfortune to be stopped almost dead by signal at that station, with 1¾ miles up at 1 in 80 immediately following. When at last we did surmount Hewish summit there came again shortly afterwards the permanent way check at Chard Junction. So we took 75 min. 5 sec. to Axminster, 61 miles, and the highest speed there was only 71½ m.p.h. In consideration of the load and the low speed of incidence, the ascent of Seaton bank was very fair, the lowest speed being 22½ m.p.h., and the time to summit post 153½ (69·7 miles) 89 min. 55 sec. Attaining 77½ m.p.h. on Honiton bank, we reached Sidmouth Junction, 75·8 miles, in 96 min. 5 sec., but the net time was probably about 88 or 89 min. Re-starting with 265 tons we passed Broad Clyst, 7·4 miles, in 8 min. 40 sec., but after that got signals on at Pinhoe and were delayed into Exeter.



Photo] [*Captain R. A. Crysta.*

CALEDONIAN RAILWAY.

Carlisle train leaving Edinburgh.
0–6–0 locomotive, No. 333.

I had one or two runs between Exeter and Plymouth by the South Western route, which were quite interesting and worthy of description, though time was not kept. On the continuation of my 3.25 p.m. journey from London the load beyond Exeter was one of seven 8-wheelers, which is, I believe, one axle above the load usually allotted to single-headed express trains over this section. Further, the engine was not one of the 5 ft. 7 in. 4–4–0's, but a 6 ft. 7 in. 4-coupled, No. 114, so there was, perhaps, some excuse for lost time. From St. David's station we ran the uphill length of 11·2 miles to Yeoford Junction with our 170-ton train-load in 16 min. 50 sec., thereby losing nearly 2 min.

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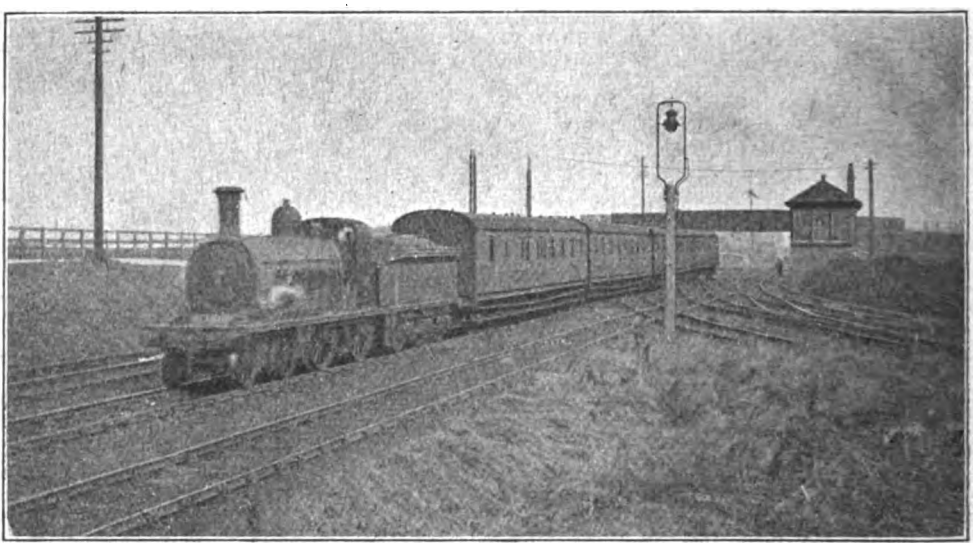
The ascent from there to Meldon Junction, high up on Dartmoor, is an arduous one, very largely at 1 in 77, and as steep in one place as 1 in 58, and on this our speed was mostly below 30 m.p.h., the minimum at the summit being 25 m.p.h. So we took 15 min. 5 sec. from Yeoford Junction to North Tawton, 8 miles; 25 min. 40 sec. to Okehampton, 14·5 miles; 31 min. 20 sec. to Meldon Junction, 17·1 miles; and 33 min. 5 sec. to mile-post 200¾ (17·8 miles), the summit. Speeds on the subsequent down-grade were moderate, as is customary, with many severe slacks, the highest rate reached being 66 m.p.h., so that the 13 miles from mile-post 200¾ to Tavistock took 15½ min. We had thus taken 48 min. 35 sec. for the 30·8 miles from Yeoford Junction to Tavistock, instead of the 45 min. allowed. The start from Tavistock is on a brief 1 in 75 up-grade, but we covered the 15·9 miles on to Devonport in 21 min. 5 sec., slacking on the early part of the descent, but with a top speed of 66 m.p.h. beyond Tamerton, and thus regained a minute. The net loss against engine was therefore only 4½ min., and nearly a minute of this had been regained by smart station work at Yeoford Junction.

In the opposite direction, on the 9.55 a.m. *ex*-Plymouth (Friary), the same engine had a load still larger by a 6-wheeler, and thus well over the unpiloted maximum, but the stock was again non-corridor, and I believe also that this train was decelerated to Exeter during the summer in view of its 10 min. later start from Queen Street. So the load totalled 180 tons, and the wind was in the south, very strong. The start from Devonport is for a short distance on a bank of 1 in 132, but we were through Tamerton, 4·8 miles, in 8 min. 10 sec., at 65 m.p.h., although on the long 1 in 73 ascent to mile-post 220½ speed dropped to 24 m.p.h. Touching 64 m.p.h. before Tavistock, we reached that town, 15·9 miles, in 25 min. 35 sec.; schedule is 24 min. Re-starting, we climbed to Lydford, 6·4 miles, in 14¼ min., speed falling to 24½ m.p.h. on the long 1 in 82–89–79–75 past Brentor. Here we dropped another 2¼ min. Ascending again from Lydford, we accelerated to 30 m.p.h. on 1 in 110–200, fell to 25 m.p.h. on 1 in 78, reached 42½ on a short down-grade beyond Bridestowe, and breasted the last 2 miles of 1 in 78 to the summit at a minimum of 30 m.p.h. Thus we passed Meldon Junction, 7·3 miles from Lydford, in 14 min. 5 sec., and, slacking over Meldon Viaduct, reached Okehampton, 9·9 miles, in 18 min. 5 sec.—a further loss of over 3 min. But we covered the 6·5 miles from Okehampton to North Tawton in 8 min. 10 sec., start-to-stop (schedule is 9 min.), with a top speed of 70 m.p.h., and from there, although



Photo] [*Frank Bell.*

NORTH BRITISH RAILWAY.

1.40 p.m. Edinburgh to Clydebank train leaving Westcraigs.
6 ft. 4–4–0 engine, No. 227.

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starting on an adverse 1 in 80, and having to slack badly at Coléford Junction, we passed Yeoford Junction, 8 miles, in 11 min. 10 sec.; St. Cyres, 14·2 miles, in 17 min. 55 sec.; and should have reached Exeter (St. David's), 19·2 miles, in 24 min., as booked, but for signals on at Cowley Bridge Junction. So on this run the engine lost 6 min. net on the winter booking, but, as previously mentioned, I believe the schedule has been increased during the summer—and rightly so, with a load 50 per cent. above normal.

I had another run over the same route behind one of the 5 ft. 7 in. 4–4–0's on the 2.15 p.m. *ex*-Plymouth (Friary), when the load was one of five 8-wheelers, or 145 tons, from Tavistock, in 25 min. 20 sec. Without this delay we should have reached Okehampton (16·7 miles) in about 29½ min., 27 min. being allowed. The engine had thus dropped just over 4 min. on the ascending grades. No time was made up downhill, the running being very tame. With a load increased to 200 tons, we passed North Tawton, 6·5 miles, in 8 min. 25 sec. Yeoford Junction, 14·5 miles, in 17 min. 10 sec. (slacking carefully over Coleford Junction), and St. Cyres, 20·7 miles, in 24 min. 10 sec.; we should probably have reached St. David's, Exeter, in the allotted half-hour but for signals again "on" at Cowley Junction.

And now, very briefly, for my return

Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

Down newspaper express. Engines, 4–6–0 No. 1521, *Gladstone* (Precedent class), piloting, and No. 1689, *Monmouthshire* (Experiment class).

very well filled, and the engine No. 134. The small-wheeled locomotive was more brisk in starting, and on the up grades generally, but sluggish downhill. We did not exceed 60 m.p.h. at Tamerton, but were through that station in 7 min. 35 sec., and reached Tavistock in 25 min. 40 sec., falling to 26½ m.p.h. on the 1 in 73. Re-starting from Tavistock, we passed Lydford in 13¼ min., with a minimum of 27 m.p.h. on the 1 in 75 at Brentor, and mile-post 200¾ (the summit), 13 miles, in 23¾ min., taking both stretches of 1 in 78 without falling below 32 m.p.h. Signals were on at Meldon Junction, however, and we stopped there, 13·7 miles journey to London. This was made by the 12.10 noon *ex*-Queen Street engine No. 300, 6 ft. 7 in. 4–4–0, having a load of eight 8-wheelers and a 6-wheeler, totalling 205 tons gross. The start was not particularly brisk, as we took 8¼ min. to Broad Clyst, 4·8 miles, 18¾ min. to Sidmouth Junction, 12·2 miles, and 27¾ min. to mile-post 153½ (summit), 18·3 miles, touching 65 m.p.h. at Broad Clyst and beyond Sidmouth, and falling to 29 and 24½ m.p.h. on Whimple and Honiton banks respectively. Down Seaton bank we reached 75 m.p.h., then slacked vigorously, and again 79 m.p.h. at the foot, passing Axminster, 27 miles, in 36 min. 40

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sec. The long 13-mile rise to Hewish was taken well, the time of 15 min. 10 sec. between mile-posts 146¼ and 133¼ being really good; the lowest rate on the 1 in 120 after Chard Junction was 44 m.p.h., and on the 1 in 120–160 to the summit exactly 40 m.p.h. Touching 76½ m.p.h. at Crewkerne and 72½ at Yeovil Junction (with an intervening minimum of 56 at mile-post 126¼) we were through these two stations, 40·1 and 48·9 miles respectively from Exeter, in 52 min. 35 sec. and 60½ min. We fell to 30½ m.p.h. on the 1 in 80 after Sherborne, but were then badly checked by signal at Milborne Port, and so took 74½ min. to Templecombe, 59·6 miles. Attaining 72½ m.p.h. at Abbey Ford, we went up to Semley with a minimum speed of 34½ m.p.h., passing that town, 70·4 miles from the start, in 86½ min. The 15·1 miles thence to Wilton, where we made the prescribed slack, were covered in 14 min. 20 sec., with a top speed of 70 m.p.h. in two places, and we reached Salisbury, 88 miles, in 104½ min., or a little under 103 min. net. As we were late away from Exeter, one might have expected a little more enterprising work, but as it was the present schedule time was, net, just about kept.

Out of Salisbury we were once again favoured with the services of a large Drummond 4–4–0, superheated—No. 470—and the addition of the slow portion from Exeter brought our load up to 50 axles, weighing loaded about 290–295 tons. The start was excellent, as we accelerated to 38 m.p.h. on the initial 2 miles of easy ascent, only fell to 35½ m.p.h. on the following 2¾ miles at 1 in 169, and maintained this rate unwaveringly on the 1¼ miles at 1 in 140 past Porton. So we passed Grateley, 11 miles, in 18 min. 50 sec., and Andover, 17·4 miles, in 24 min. 40 sec., at 71½ m.p.h. The 3 succeeding miles' ascent at 1 in 178 reduced the rate to 50½ m.p.h.; after touching 56 m.p.h. at Hurstbourne we fell to 53 on the 1⅜ miles at 1 in 194 to Whitchurch, and maintained that speed on to 1 in 550 thence past Overton. So Whitchurch, 24·5 miles, was passed in 32 min. 20 sec., Battledown Junction, 32·7 miles, in 41 min. 25 sec., and Basingstoke, 35·9 miles, in 44½ min., but then, alas! with every prospect of running to time, we were brought to a dead stand at mile-post 43¼ by the first portion of our train having broken down at Hook. This 40·5 miles' journey had taken 48 min. 50 sec., but the remainder of the trip is not worth description. Here I must bring my remarks to a close, reserving the details of some running on the Southampton route for a future occasion.

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

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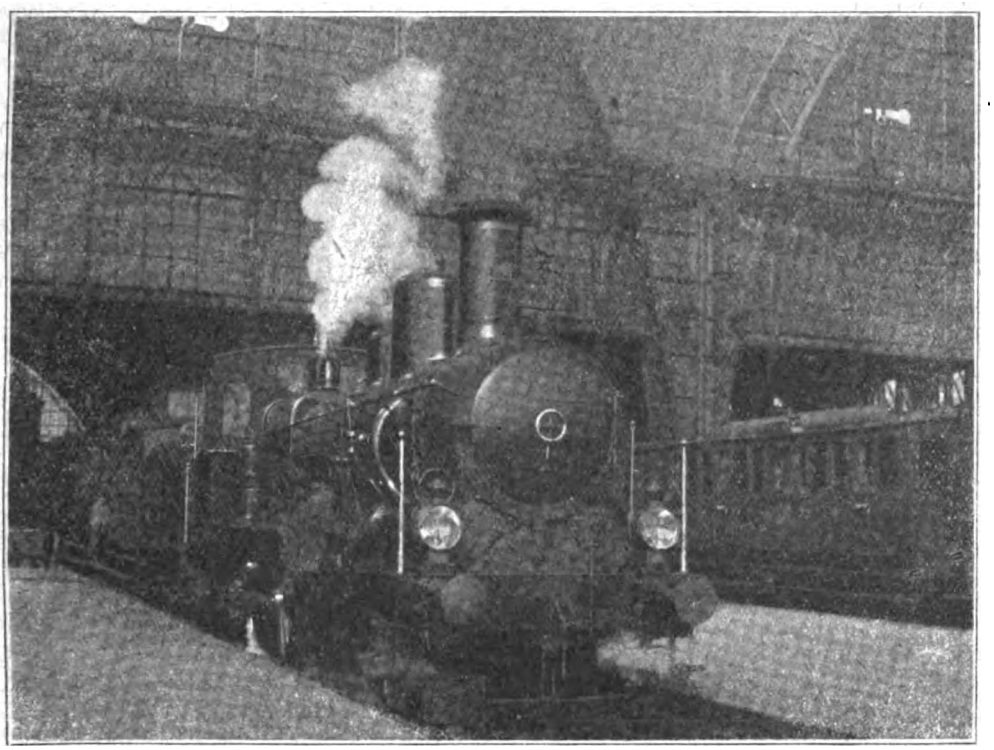
German Railways During the War.

IT is naturally far from easy, even for one resident almost on the borders of Germany, to ascertain many definite facts about railway matters there. Nevertheless, a certain amount of information does leak out in course of time, enough to make it beyond doubt that the German railway world of 1917 is very different in many respects from that of three years ago. Of rolling-stock, for instance, according to a correspondent resident at Berne, there is unquestionably an insufficiency, but this is less serious than the scarcity of lubricants. Trucks and carriages required for army purposes must, of course, have the preference as regards lubrication, and only after they have been oiled, and not before, can the attention of the railway authorities be devoted to oiling rolling-stock required for the purposes of the civilian population. It has been noticed in Switzerland that the trucks in which German iron and coal are sent are always different, and that the grease boxes are, apparently by chance, invariably empty. In accordance with their custom, the Swiss Federal Railways fill the empty German grease boxes, and thus Germany gets a little lubricating material to which she is not entitled, although but a small quantity in comparison with her requirements. It is, so some Swiss engineers assert, at least as much owing to shortage of lubricants as to scarcity of rolling-stock that Germany first began not to keep her engagements as regards sending coal to Switzerland, and has now agreed to send only a much less large quantity than the Swiss actually require.



EXPRESS TRAIN READY TO START FROM FRANKFORT.

It must also be remembered that, besides

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keeping pace with army requirements, German rolling-stock has to cover a far greater extent of territory than before the war. It must run, for instance, into and over the occupied parts of Belgium, France, Serbia and Roumania. In normal times it was reckoned that in Germany about 8 per cent. of German railway engines and trucks, &c., were always under repair. At present it is stated that the proportion of German rolling-stock which, for one cause or another, is laid up is over 23 per cent. Some time ago, indeed, it was as high as this, and must by now be higher, especially as the boiler tubes are now mostly made of cast-iron and are much less durable than were those formerly in use, which were made of bronze or copper.

Innovations in express train services are the recently introduced iron* passenger cars and dining cars, in use on the so-called D trains between Berlin and Cologne. The non-expert entering one of these new iron carriages would probably notice nothing peculiar about them, for the walls and floor are covered over with wood. The iron cars, however, are noticeably longer than the wooden cars, and also the roof projects to a remarkable extent, which is said to ensure better ventilation. The change from wooden to iron railway carriages in Germany is, so it is asserted, gradually to be effected on all lines. It might be thought that iron cars would be much heavier than wooden ones, but this is not the case. Indeed, the iron cars are, it is claimed, much lighter than the wooden ones, because they require for their construction comparatively far less material.

Naturally the war has brought about many minor changes in the working of German railways. In particular, as in England, it has caused many women to be employed in positions formerly invariably filled by men. Women ticket collectors and women guards, for instance, seem to be as usual in Germany now as in England, and though they were at first employed only on slow trains, it was not long before they were found on expresses also. Recently as many as 30 women guards were working on the Bavarian railways alone, where, as on other lines in Germany, they are obliged to wear a modified form of masculine attire, in order to avoid the danger of skirts catching in doors.

From August 1st a new railway charge has been introduced in Germany, apparently as a means of raking in more money—a charge of an additional 7 per cent. on the cost of transport of all goods sent by rail, whether for long or short distances. This 7 per cent. must be paid by the sender. More interesting is the fact that from July 1st last it was made compulsory to send certain categories of goods in Germany by water—wherever this is possible, that is to say. (Germany has 9,375 miles of navigable inland waterways.) Everything is being done besides to encourage the sending of goods by water, the newly introduced taxes on goods traffic having been removed, within certain limits, in the case of goods which are sent by water, but which it is not compulsory to send by this means. Certain classes of goods may in any case no longer be sent by rail from particular places on the Elbe, Oder and other rivers, but only by water, by a regular service of cargo steamers, running between Altona and a number of other places, including Berlin, and between Berlin and other places. Moreover, surtaxes have been introduced on passenger tickets, amounting on a first-class ticket to 16 per cent., on a second-class ticket to 14 per cent., on a third-class ticket to 12 per cent., and on a fourth-class ticket to 10 per cent., with an extra charge for luggage of 12 per cent. on the ordinary cost of its conveyance. From this it may be inferred that the financial condition of German railways cannot be altogether brilliant.

* The correspondent says *iron* but he probably means *steel*.—*Ed.*

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By courtesy] *[G.W.R. Magazine.*

MR. C. ALDINGTON,
Superintendent of the Line, Great Western Railway,
and the Company Officers.

British Railway Service and the War. [XIX.]

IN addition to furnishing men for the regular army and for working the railways serving the fighting forces overseas, much is being done by the railway service in the homeland to add military efficiency to its capabilities in the transport industry. How railway officers and staff manage in these days of stress and strain, to find time for military training in addition to their ever-trying duties, is best known to themselves, but, nevertheless, it is being done, and all honour and credit is due to railwaymen who from pure patriotism, sacrifice for their country's sake the little leisure that falls to their share.

A case in point is the Great Western Railway Volunteer Company, recently "sworn in" at the headquarters of the Paddington Battalion (County of London Volunteer Regt.).

At this function the Company—numbering upwards of 150—in their new uniforms, which had been provided from a fund supplied by the Great Western Railway Directors, looked spick and span, and went through their manœuvres with creditable smartness.

The Honorary Commandant, the Mayor of Paddington (Alderman H. G. Handover, J.P.), administered the oath. He was accompanied by the Officer Commanding (Captain Ralph T. Squire), the Adjutant (Capt. Borgars), other officers of the battalion, and Mr. Charles Aldington (Superintendent of the Line).

The Commanding Officer read a letter from Mr. Frank Potter (General Manager) expressing regret at his inability to be present, conveying his best wishes for the complete success of the movement, and telling of his confidence that the men who had joined the Company would maintain the reputation of Great Western men for thoroughness and spare no effort to become efficient in the shortest possible space of time.

After administering the oath, His Worship the Mayor of Paddington announced that to mark the occasion he would allow the battalion the use for drill purposes of the hall adjoining the headquarters—comprising commodious and most convenient accommodation.

Mr. Charles Aldington made a short but inspiring speech. The élite of the nation's manhood, he said, were in the fighting line, and men like those around him were forming a rearguard. He saw many there who had repeatedly pressed to be released to take their places in the front line, but permission had had to be denied them on account of

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their technical duties. In the Volunteer Company, however, they were meeting in some degree their military aspirations. Ours was a fair country to fight for and a glorious empire to defend. We enjoyed freedom and liberties such as no other people had ever possessed, but their continuance could be assured only through our united efforts by sacrifice; but when the war was over, those who had suffered would be the proudest. It reflected credit upon his hearers that, with their arduous work, they were willing to devote what leisure time they had to military duties. He was impressed with their smartness and steadiness on parade after so short a training. The men should be proud of their officers and try to make the officers proud of them. They had made a good beginning, and he recommended them now to "go for the honours."

On behalf of the Mayor and officers of the battalion, Captain House thanked Mr. Aldington for attending the function and for his encouraging address to the men.

The Company Commander is Lieut. F. T. Barrington Ward, the well-known barrister, who has been associated with the Great Western Railway in legal matters and in many important cases. He is an enthusiastic volunteer and a painstaking and patient officer. From the first he completely captivated the admiration and devotion of the men of the new Company.

The invaluable services rendered by railwaymen of all grades at home to the nation during this time of stress are, says *The Railway Gazette*, not only unchallenged, but have been enthusiastically admitted. Full justice has been done, verbally, to the secrecy, skill and smoothness with which the first Expeditionary Force was despatched, and the military authorities have again and again expressed their appreciation of the way in which the munitions traffic and other military movements have been handled by the railways. Yet, in practice, this recognition has not gone very far. The distribution of honours to railway officers, for instance, has been largely confined to those whose services have been lent to the Government for railway work abroad or for other than railway duties at home, whilst the devotion of those who have stuck to the arduous and somewhat thankless duties of railway management and superintendence at home has to a very large extent gone unrewarded.

It may be stated without exaggeration that the only war honours conferred on railway officers at home have been the K.C.B. awarded to Sir Herbert Walker, the Knighthood conferred on Sir Francis Dent, the Commandership in the Order of the British Empire given to Mr. Arthur Watson (Superintendent of the Line, Lancashire and Yorkshire Railway), and the C.B. given to Mr. T. M. Williams, Docks and Marine Superintendent, London and South Western Railway. The other titles given to railway general managers during war time, or, for instance, the knighthoods conferred on Sir William Forbes, of the Brighton Railway, and Sir John A. F. Aspinall, of the Lancashire and Yorkshire Railway, were long overdue, and, consequently, cannot be regarded as real railway war honours. On the other hand, no less than four honours have been conferred on members of the Executive of the National Union of Railwaymen, Mr. J. H. Thomas being made a Privy Councillor, Mr. G. J. Wardle a Member of the Order of the Companions of Honour, Mr. A. Bellamy a Commander of the Order of the British Empire, and Mr. Walter Hudson an Officer of the same Order.

This omission to recognise more fully the services of men who have been engaged in the arduous duties of management and superintendence of the railways at home during these particularly trying times is all the more marked now that two new orders of merit have been instituted. In the past, honours have been too much associated with purely party services, and have also been regarded as to some extent a preserve of the Civil Service. But it is not so now with the inauguration of these new orders, which are especially intended as a recognition of good work done in the nation's service in a civil capacity. It cannot be denied that railwaymen are pre-eminently eligible for this form of honour. Anyone who has been closely in touch with the working of British railways during the past three years will bear witness to the great national services performed not only by our general managers, but also by the superintendents and the mechanical engineers. The most suitable authority for making recommendations in this sense to the proper quarter is the Board of Trade. It may be that the present head of this Department, being a railwayman himself, feels some delicacy in putting forward railwaymen's claims in this direction; but be that as it may, justice should be done.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper right-hand corner, and address them to the Editor. Questions relating to the names, numbers, dates, dimensions, etc., of locomotives should not be forwarded, and queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE. *Queries should not be of purely local interest. Correspondents are requested to write on one side of the paper only, and they must give their names and addresses, but a pen-name or initials may be inserted for Editorial use.*

Sturrock's "Steam Tenders" on the Great Northern Railway.

Mr. Sturrock's first experiment with a steam tender was made in 1863, when the tender of the old "Sharp" single No. 46 was fitted with 12 in. by 17 in. cylinders (inside) and the necessary motion, the tender thus becoming an auxiliary 0–6–0 engine with 4 ft. 6 in. wheels. After successful trials, the 0–6–0 engines 391, 393 and 394 were definitely provided with steam tenders, modifications at the same time being made in the boilers and fireboxes in order to meet the additional drain on the steam supply. So successful were these engines from the traffic point of view, in view of their greatly increased hauling powers, that 70 similar locomotives, with steam tenders, were ordered from outside builders. After a number of these had been delivered, however, it was found that, not only were the trains hauled too unwieldly to be handled, with the limited traffic resources then available, but that the repairs bill of the engines concerned was unduly heavy, and the further output of steam tenders was then stopped. The maximum number of engines running so equipped probably amounted to 50, but the steam tenders were all removed by Mr. Sturrock's successor. It is interesting to note that the original experimental tender was lent to the Manchester, Sheffield and Lincolnshire Railway, who themselves subsequently ordered six steam tenders.

[Reply to J. P. BRIERLEY.]

Locomotive Exchanges.

You are not quite correct in referring to the exchange of locomotives which took place in 1910 between the Great Western Railway and the London and North Western Railway as a "competition": the locomotives were lent in each case in order that comparative data as to their work might be made by each of the two companies concerned with a view to possible modifications of future locomotive design. That being so, no "full account" of the doings of the two engines has been published, as the results of the trials were never given out officially; but details of runs behind the two engines appeared in these columns and elsewhere at the time. Similar exchanges at about the same period took place between the London and North Western Railway and the Great Northern Railway (a "Precursor" for an "Atlantic"); the London and North Western Railway and the London, Brighton and South Coast Railway (a "Precursor" for a 4–4–2 superheater tank); the London and North Western Railway and the Caledonian Railway (an "Experiment" for a "Cardean" 4–6–0 superheater); while the North British Railway also loaned an "Atlantic" for experimental running between Carlisle and Crewe. Another exchange was one of 4–4–0 engines between the North British and Highland Railways.

[Reply to R. W. P. HORSFORD.]

Which is the Richest Railway in the British Isles?

An answer to this question depends on the basis on which the "wealth" of any particular company is estimated. The Midland Railway has the largest capital—£203,857,712—but this includes certain nominal additions, *i.e.*, it has been "watered." The capital of the London and North Western Railway is £124,886,466 and of the Great Western Railway £99,532,150. Again, the net revenue of the Midland is the highest of any—£6,362,738 per annum against the London and North Western £6,334,595 and the Great Western £5,929,035. On the other hand, the gross revenue of the Midland is only £15,962,757, whereas that of the Great Western Railway is £16,020,995 and of the London and North Western Railway £17,219,060. The dividends paid on ordinary stock are 7 per cent. by the London and North Western Railway, 6¼ per cent. by the Great Western Railway, but only 2½ per cent. by the Midland on the Deferred

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ordinary stock (4½ per cent. Preferred). These are the last pre-war figures, for the year 1913. On the whole, the London and North Western Railway probably has the best all-round claim to the distinction indicated in the title.

[Reply to SAPPER HOARE.]

Locomotive Working on the Cheshire Lines.

Passenger train services of the Cheshire Lines Committee are operated by Great Central Railway engines, with the exception of a few through Midland trains between Chinley, Stockport and Liverpool, for which the Midland Company finds locomotive power. The Manchester–Liverpool and Manchester–Southport trains are mostly hauled by Great Central Railway 4–4–0's of Mr. Pollitt's design, now equipped with superheaters. Short-distance passenger trains are worked principally by Great Central Railway 4–4–2 tank engines. Local goods traffic is worked largely by the Great Central Company, but through goods trains for points of the Cheshire Lines system are worked by the engines of the company concerned, *i.e.*, Great Central, Great Northern or Midland.

[Reply to "SHANGO."]

French Locomotive Enumeration.

French locomotive numbers are generally so arranged as to indicate the type or wheel arrangement of the engine to which they refer. On the State lines, for example, 231.639 would indicate "Pacific" type engine No. 639, the "231" corresponding in axles to our "4–6–2." On other lines, as the Nord, however, the coupled axles only are indicated, eight-coupled engines having a prefix of 4, six-coupled of 3, and four-coupled of 2. It may be remembered that the Nord "Pacific" engines mentioned in "British Locomotive Practice and Performance" of last month bore the numbers 3.1154, 3.1156 and 3.1157, indicating six-coupled engines 1154, 1156 and 1157 respectively.

[Reply to LIEUT. COLIN MCLAREN.]

The Largest Signal-Boxes.

The largest actual signal-box building in Great Britain is probably the Locomotive Yard Box at York, North Eastern Railway (just south of the station), which contains 295 manually operated levers in one continuous frame. There are two much more extensive power installations, however viz., Glasgow, St. Enoch, Station Box of the Glasgow and South Western Railway, with 488 levers, and Glasgow Central Box of the Caledonian Railway, with 374 levers, but these are, of course, compressed into a much smaller relative space. The latter is an electro-pneumatic installation, and the former all-electric except as regards the switches, which are manually operated.

[Reply to SAPPER HOARE.]

The Flying Dutchman.

This Great Western Railway train was instituted in 1862, leaving Paddington at 11.45 a.m. The time was altered in 1904 to 12.25 p.m. The present development of it is probably the 1.0 p.m. from Paddington to Penzance. Seeing the train travels from east to west and the original "Flying Dutchman" of the legend beat around the Cape of Good Hope from west to east, the responsible people in the early 'sixties did not choose a name particularly apposite, but perhaps there were other reasons unknown to the present generation for bestowing such a distinctive title.

[Reply to PRIVATE E. H. C. JOSLIN.]

Great Southern and Western Railway Express Trains.

It is clear the Dublin correspondent to whom you refer was using the Great Southern and Western method of enumeration. Presumably one bogie coach he reckoned as "= 2."

In regard to the latter part of your query, you evidently possess the fallacious idea that the smallest engine which will pull the train is the most economical. Often it is the exact reverse. Further, the gradients on the Great Southern and Western Railway, taken on the whole, are considerably harder than those on the Great Northern Railway (Ireland).

[Reply to "PUZZLED."]

Six-Coupled Passenger Engines, Midland Railway.

The only passenger engines on the Midland Railway having six wheels coupled are the numerous class of 0–6–4 tank engines, and also the eight 4–6–4 tank engines taken over by the Midland Railway with the rolling stock of the London, Tilbury and Southend Company. The whole of the latter and a good proportion of the former, however, are employed at present on goods trains. The point raised by your friend concerning London and North Western Railway engines is not of sufficient interest to deal with here.

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He probably saw a 2–8–0 Webb compound coal engine.

[Reply to G. PRITCHARD.]

Durston Loop, Great Western Railway.

The avoiding line of the Great Western Railway from Athelney to Cogload Junction was constructed, as a part of the general scheme of the Westbury route to the West of England, in order to allow of a fast-running junction with the old main line *viâ* Bristol, and also to economise 25 chains in the distance. The majority of the slow trains from Taunton to Castle Cary and Taunton to Yeovil, however, still use the old route *viâ* Durston, joining the new line at Athelney.

[Reply to C. J. P. DORMAN.]

Doubling of Highland Railway, Blair Atholl to Dalwhinnie.

In doubling a severely graded single line, it is nearly always the steepest stretches that are taken in hand first, in order to obviate the delay to traffic in both directions occasioned by heavy trains ascending the banks. This has been done on the Highland Railway from Blair Atholl northwards, where the line rises almost unbrokenly at 1 in 70–80 for 17 miles to Drumochter Summit, 1,484 ft. above the sea, and falls thence for 5½ miles, mostly at 1 in 80, to Dalwhinnie.

[Reply to C. J. P. DORMAN.]

Midland Railway Express Locomotives.

It is impossible to state the exact considerations which influence the locomotive authorities of any line in deciding for or against any particular wheel arrangement, and for this reason we are quite unable to inform you why the Midland Railway has at present shown no leaning towards 4–6–0 locomotives. Doubtless there are excellent and sufficient reasons for the methods of working at present adopted by that company in the exclusive use of 4–4–0 engines for express passenger service.

[Reply to E. A. BROTHERS.]

London and South Western Railway Heavy Locomotives.

Engines 330–335, 369–373, 443–472, 482–491 (in each case inclusive) and 720 are only allowed to travel between Waterloo and Exeter, Waterloo and Bournemouth West *viâ* Sway, Bournemouth Central and Dorchester, and Salisbury and Southampton, as the underline bridgework on other portions of the line has not been strengthened sufficiently to bear their weight. These sections, however, include practically all those portions of the line over which fast and heavy traffic is worked.

[Reply to R. W. CLARKE.]

Great Western Railway "Record of Records," May 9th, 1904.

There is no record of the actual maximum speed attained by the 4–2–2 engine *Duke of Connaught* between Bristol and London being made public, but it was probably not very exceptional, owing to the absence of any marked down-grade on the journey. We may mention, however, that the comparatively level 17 miles 42 chains between Reading and Slough were covered in 12 min. 54 sec., at an *average* speed of 81·5 m.p.h. The load behind the tender was 120 tons.

[Reply to A. DAVIDSON.]

Midland Main Line.

The original line between Sharnbrook and Irchester is still in use for passenger and goods traffic. The loop line, partly in a tunnel, is known as the Wymington Deviation, and is used for goods and mineral traffic only. It was opened in May, 1884. The original line forms part of the Leicester and Hitchin line opened in 1857, and not part of the Bedford and London line as inferred by inquirer.

[Reply to ANGLO-SCOT.]

Axholme Joint Railway.

This railway is the property of the Lancashire and Yorkshire and North Eastern Railway Companies and, by arrangement, the Lancashire and Yorkshire Railway provides the locomotive power. The goods rolling stock of the two companies is, however, used over the line. The passenger service is conducted by the Lancashire and Yorkshire engines and carriages on behalf of the Joint Committee.

[Reply to J. BOND.]

London and South Western Railway Dining Cars.

We presume that the working of these cars is not continued in a westerly direction beyond Bournemouth and Exeter respectively, both because the limited patronage extended to them on these western sections would not be sufficient to warrant their running forward, and also as a natter of convenience in their return working to London.

[Reply to R. W. CLARKE.]

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Water Capacity of Tenders.

Water capacity of the second batch of London and South Western Railway 6 ft. 7 in. 4–6–0 express engines is 5,800 gallons. These locomotives were built for the 2-hour London–Bournemouth runs. The 5,200 gallon tenders of the Urie 4–6–0 locomotives carry 7 tons of coal, whereas the 5,800 gallon tenders carry only 5 tons of coal.

[Reply to R. C. ENGLISH.]

Mr. Gresley's Top-feed Arrangement on Great Northern Locomotives.

The double dome that you have noticed on 2–8–0 superheater coal engine No. 459 on the Great Northern Railway contains Mr. Gresley's patented top-feed arrangement, illustrated and described in the present issue. No. 589 and one or two others of the large superheater 0–6–0 engines are similarly equipped.

[Reply to R. A. KINDON.]

Brakes on Bogie Wheels.

Brakes on bogie wheels of locomotives are fitted in order to provide the engine with a maximum of braking power, and are more common in other countries than they are here. The bogies of all the Midland 4–4–0 rebuilds are being brake-fitted as they come into the shops for superheater equipment.

[Reply to A. VAN DER MEULEN.]

Train and Through Carriage Destinations.

There are now no through carriages between London (Waterloo) and Swanage, or *vice versa*. You will find other information you require in "Bradshaw's Guide." Space in the RAILWAY MAGAZINE is too valuable for recapitulation here. Thanks for compliments and good wishes.

[Reply to R. W. CLARKE.]

Classification of Locomotives.

The small figure to which you refer is placed under the number plate of Great Central Railway engines for the guidance of the railway staff, and merely refers to a classification table.

[Reply to J. P. BRIERLEY.]

Midland Railway Locomotives.

The decision to alter the colour of Midland Railway locomotive stock from green to crimson lake was made in October, 1883. With regard to re-numbering, this was effected in 1907.

[Reply to J. C. SEARLS.]

French Railway Signalling.

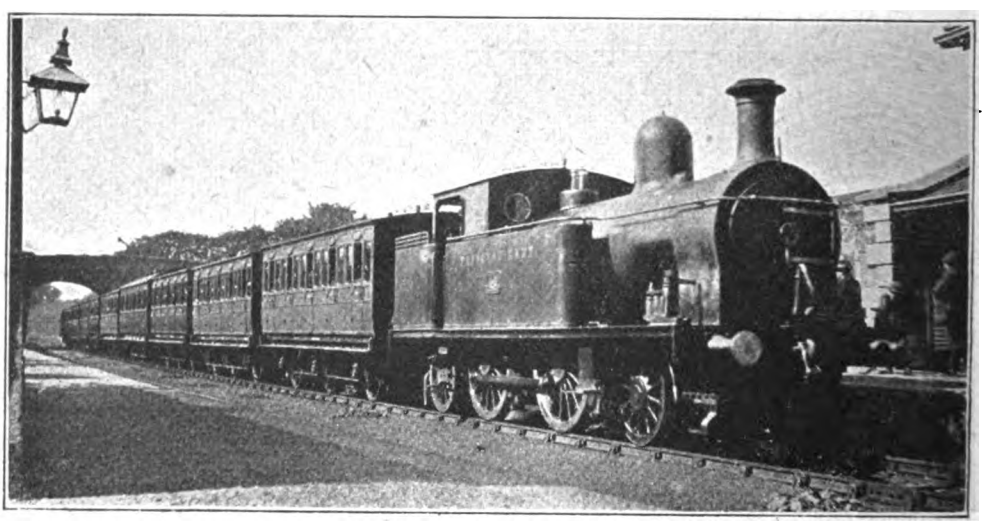
See Lord Monkswell's book, "French Railways," pages 48–52. The subject is much too complicated and extensive to be dealt with in a paragraph. Thanks for good wishes.

[Reply to LIEUT. COLIN MCLAREN.]

Train Speeds.

Statement in RAILWAY MAGAZINE was quite correct. 46¾ miles in 49 minutes is faster than 48 miles in 56 minutes.

[Reply to R. W. CLARKE.]



Photo] [*Herbert H. Cogklan.*

DUBLIN AND SOUTH EASTERN RAILWAY.

Local train in Shankhill station. 2–4–2 tank engine, No. 40, *Princess Mary*.

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Top Feed Arrangement for Locomotive Boilers.

GREAT NORTHERN RAILWAY.

BY the courtesy of Mr. H. N. Gresley, Chief Locomotive Engineer of the Great Northern Railway, the RAILWAY MAGAZINE is able to give a half-tone illustration of the 0–6–0 type goods engine, No. 589, which has been fitted with a top feed arrangement, patented by Mr. Gresley, and to present drawings.

The purpose of the arrangement is that of purifying the feed water and heating it before it reaches the boiler, and an object principally aimed at is that of ensuring greater economy by the use of the live steam in effecting the heating of the feed water. It is worthy of note that with the arrangement of top feed devised by Mr. Gresley, temperatures of 350° for water entering the boiler have been recorded.

Live steam feed-water heaters have been used for many years in marine work with satisfactory results, both from the point of view of economy in coal consumption and in reducing the strains set up in boilers by the introduction of cold feed water.

No economy can, of course, result from the transference of heat units from the live steam in the boiler to the feed water. The economy results from the fact that the rate at which cold water absorbs heat is relatively low, and that it is increased as the temperature rises, reaching its maximum when the water is in violent ebulition. When water at lower temperature than the temperature of saturation is fed into a boiler, the heat transmission from the tubes is retarded to such an extent that the tubes attain a temperature from 20° to 40° Fahr. above saturation temperature—the result being a higher temperature of the smokebox gases, and therefore increased fuel consumption. But if the temperature of feed water entering the boiler is raised so as to be nearly equal to the temperature of saturation, the heat transmission from the tubes to the water is considerably increased. As a consequence the temperature of the smokebox gases is lower, more heat is transmitted from the fuel to the water, resulting in more efficient and economical working. It has further been found that the more heavily a boiler fitted with this form of live steam feed-water heating is worked, the greater is the economy.

Without a feed-water heater it is probable that a greater proportion of the boiler's heating surface is occupied heating up the feed water than in actual evaporation.

In a locomotive this has a most important bearing, as when working heavily up a bank the maximum demand is made on the boiler at the time when its efficiency in transmission of heat from the fuel to the water is diminished by the fact that feed water is being introduced at the highest rate. The use of a live steam feed-water heater, therefore, renders a locomotive boiler more responsive to the demands made upon it. Further, it obviates the tendency of leaking tubes due to the boiler being fed with water at comparatively low temperature.

The arrangement of the apparatus is shown in the sectional drawing on page 347. The water on its way from the injectors is delivered into a relatively large water collecting and impurity depositing chamber set in front of the steam dome, and it is here heated by live steam before passing into the boiler proper. The feed pipes, which are provided with clack valves, connect with an inner port or aperture at the top of the dome-shaped chamber, and immediately beneath this inlet port there is placed a spreading plate on to which the water falls, and by means of which it is spread into a film or broken up into spray. This spreading plate is of inverted dish form and is mounted upon a vertical pipe leading from the steam space of the boiler to the plate, as the drawings show, closing the upper end of the pipe. The latter is perforated with 16 holes of ½-in. diameter, and its lower end is open to receive steam from the boiler. Live steam is thus constantly delivered by the pipe through the perforations to the chamber.

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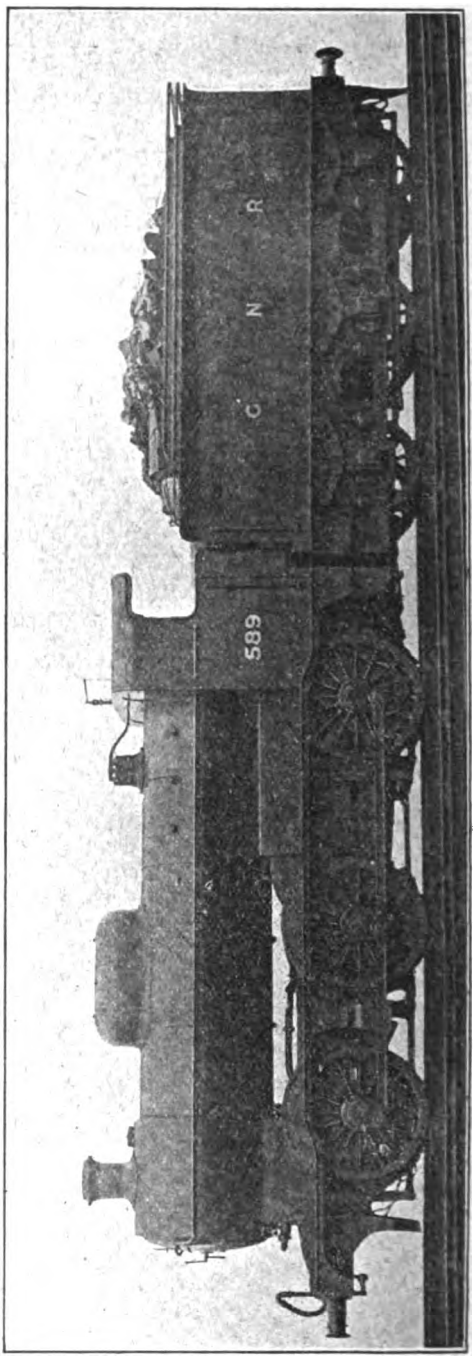
Mounted below the spreading plate or upper tray are three other trays, each being larger in area than the one above it, and all having low upstanding sides. The water delivered on to the top tray or spreading plate, flows to the tray next below it, and overflows the sides of this tray on to the next. We notice that provision is made in the patent specification for perforating the trays themselves, and in such a case certain quantities of water would flow from the trays to the perforation, but the greater amount would still overflow the sides. The bottom of the chamber is closed, but two additional pipes pass there through and are open-ended and adapted to receive the water heated in the chamber, and deliver it into the steam space of the boiler. These pipes are located one at each side of the chamber so as to lie on opposite sides of the central plane of the boiler. Within, the chamber hoods are placed above the open ends of the water delivery pipes, and these hoods are so placed as to prevent the water fed to the chamber and spread by the spreading plate and trays being delivered directly into the water delivery pipes.

The water in passing over or through the trays meets and receives heat from the live steam from the boiler, and when it reaches the level of the upper end of the delivery pipes it passes down them into the steam space of the boiler in a heated condition, being further heated in passing through the steam in the steam space. It will be understood that in working the chamber constantly contains the water in a heated condition up to the level of the top end of the water delivery pipes, and that the further feed of water to the chamber causes the level to rise and water to flow down the pipe.

The base of the chamber is constituted by the boiler shell, and it follows therefore that the sediment or impurities deposited by the water in the chamber, other than those which are deposited on the trays, principally collect at or fall to the portions of the base which are lower than the central portion, and in order to discharge these collected deposits, a drain or blow-off pipe controlled by a suitable valve is led from the chamber and discharges at a convenient point on the end, this pipe being divided or branched within the chamber, one branch being open to one side and the other similarly open to the opposite lowermost portion of the chamber. The deposit discharge arrangement is such that on the valve in the drain or blow-off pipe being open the steam pressure in the chamber, constantly supplied from the boiler, forces the deposits into and through



the branches of the drain pipes until eventually the deposits are followed in the drain

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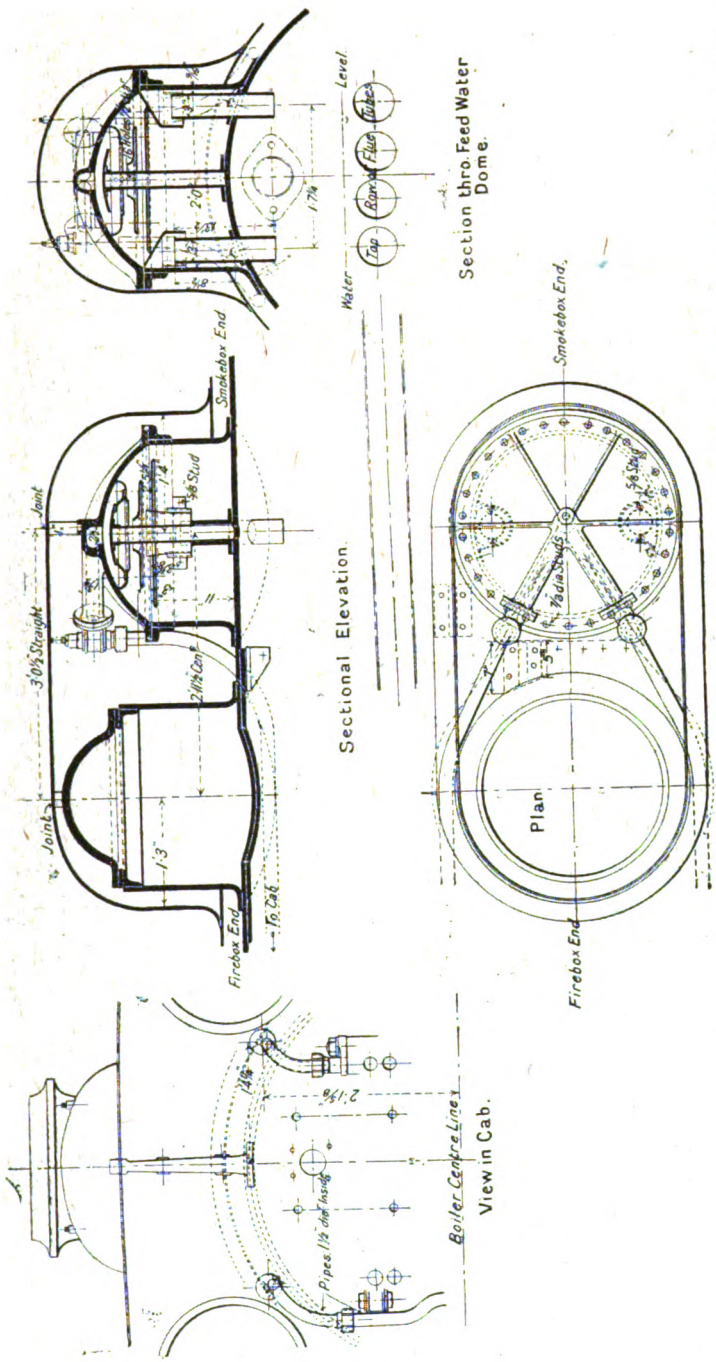

TOP FEED ARRANGEMENT PATENTED BY MR. H. N. GRESLEY, CHIEF LOCOMOTIVE ENGINEER, GREAT NORTHERN RAILWAY.

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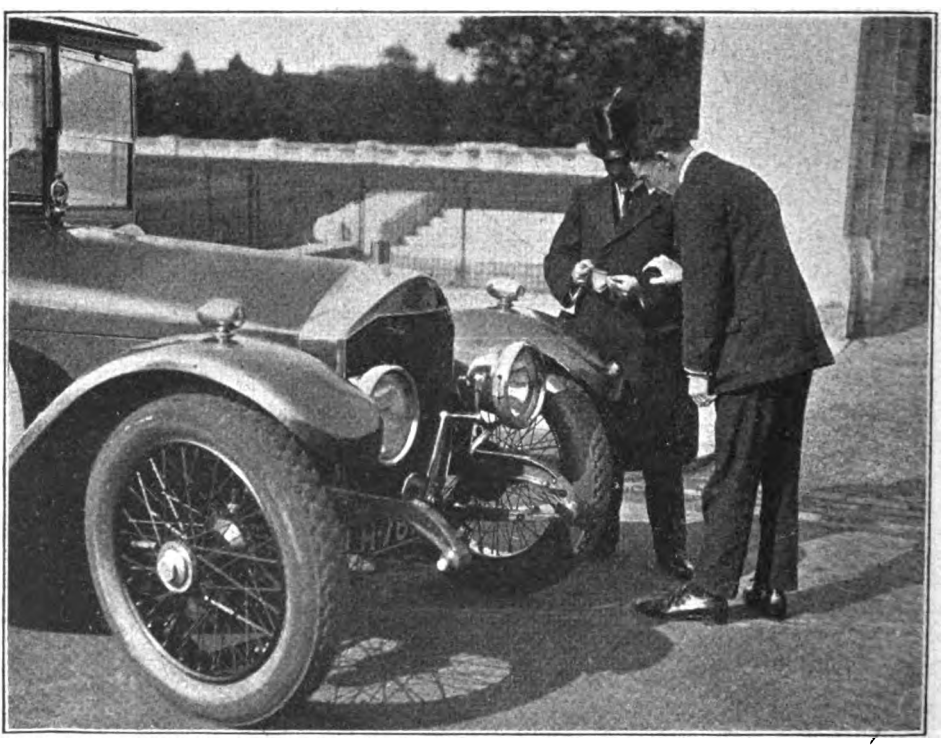
pipe by the water from the chamber, whereupon the blow-off valve or drain cock is closed and the discharge from the chamber stopped.

From the foregoing, RAILWAY MAGAZINE readers will comprehend that the apparatus is of simple construction, with nothing likely to interfere with its regular working. Mr. Gresley states that it has proved successful on those engines so far fitted. The locomotive illustrated belongs to the J22 class, with superheater boiler. It has cylinders, 19 in. diam. by 26 in. stroke; total heating surface, 1,230 sq. ft.; grate area, 19 sq. ft.; working pressure, 170 lb.; coupled wheels, 5 ft. 2 in. diam. These engines are proving highly efficient in regular working on the Great Northern Railway. The arrangement is also fitted on one of the heavy 2–8–0 type coal engines belonging to the company.

A NAPIER CAR AT BUCKINGHAM PALACE.



Like the railways the motor-car builders of Great Britain have been much to the fore in providing the Government with means of transport of most vital importance, since the outbreak of war in August, 1914. The above illustration depicts a 30/35 h.p. six-cylinder Napier car outside Buckingham Palace. The occasion was the investure by His Majesty the King of the new Order of the British Empire, of which Order the honour of Commander has been conferred upon the Managing Director of Messrs. D. Napier and Son, Ltd., Mr. H. T. Vane.

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A Notable Railway Signal Engineer.

ON October 2nd the death was announced of Mr. W. R. Sykes, who entered the service of the London, Chatham and Dover Railway in 1863, and there remained until the working union with the South Eastern in 1899. On his retirement he was appointed Consulting Electrical Engineer to the Managing Committee, and as he retained this position up to his death, he may be said to have served the Chatham Company for a period of 54 years.

Mr. Sykes spent his earlier days with the Electric Telegraph Company. His duties in the examination, maintenance and repairs of telegraph instruments, together with work done at nights for Shepherds, the chronometer makers, qualified him for the position he took up in 1863 in the telegraph maintenance shops of the Chatham Railway. Mr. Sykes had only been with the railway a few months when he effected a decided improvement in the block instruments. These were only a bell instrument, and gave no indication when a signalman had sent a signal; he could only tell by consulting his train register. Mr. Sykes added an indicator which the man actuated when he sent a bell signal. Soon after, he wished to provide a tape inside the instrument to record automatically what block signals were sent and received and the time thereof.

THE LATE MR. W. R. SYKES.

In 1872 he installed at the Victoria station of the Metropolitan District Railway a set of automatic signals wherein a red lense, normally in front of a white light, was raised electrically by a current set up when a train had proceeded through a section and had passed over an electrical contact. At the signal itself there was another contact which would throw the signal to danger and clear that immediately in the rear. This item in the history of automatic signalling may be accompanied by the record that in 1864 the deceased put down at Brixton, and afterwards at the Crystal Palace station, an installation of track-circuiting, but it had to be taken up because it was found that the washing of the carriages spoilt the insulation. In his patent for the automatic signalling the recording of the block signals on a tape was covered.

Following up his idea, as revealed in the scheme for automatic signalling, that all block movements should be madein a cycle, *i.e.*, that the respective block signals and the lowering and restoration of the signals should be done in a certain sequence, Mr. Sykes evolved, in 1874, his initial "lock-and-block." This he submitted to the manager, who considered that it was no good. Eventually, the manager thought that it might be tried at a quiet place down the line, but Mr. Sykes wanted it to be tested under the severest conditions and suggested that it be put in at the three consecutive boxes—Shepherd's Lane, Brixton and Canterbury Junction. This was agreed to, and in 1875 a patent was taken out, and therein the system was referred to as a "combined lock-and-block," a term which has remained.

There is no need, having given the history of the origin of "lock-and-block," to trace its growth. It should, however, be said that its use was constantly recommended by the Board of Trade in their reports on accidents.

It was a Board of Trade report that led to the introduction of the Sykes depression bar for preventing signals being lowered when the line ahead was occupied or otherwise fouled. The accident in question was one at Stewart's Lane Junction on October 18th, 1879, when a passenger train was turned into a goods train, the tail of which was foul of the passenger line. This form of protection is now given by track-circuits, but they were not fully developed in this country until about eight or ten years ago, so it will be appreciated that the depression bars referred to served a valuable purpose. Mention might

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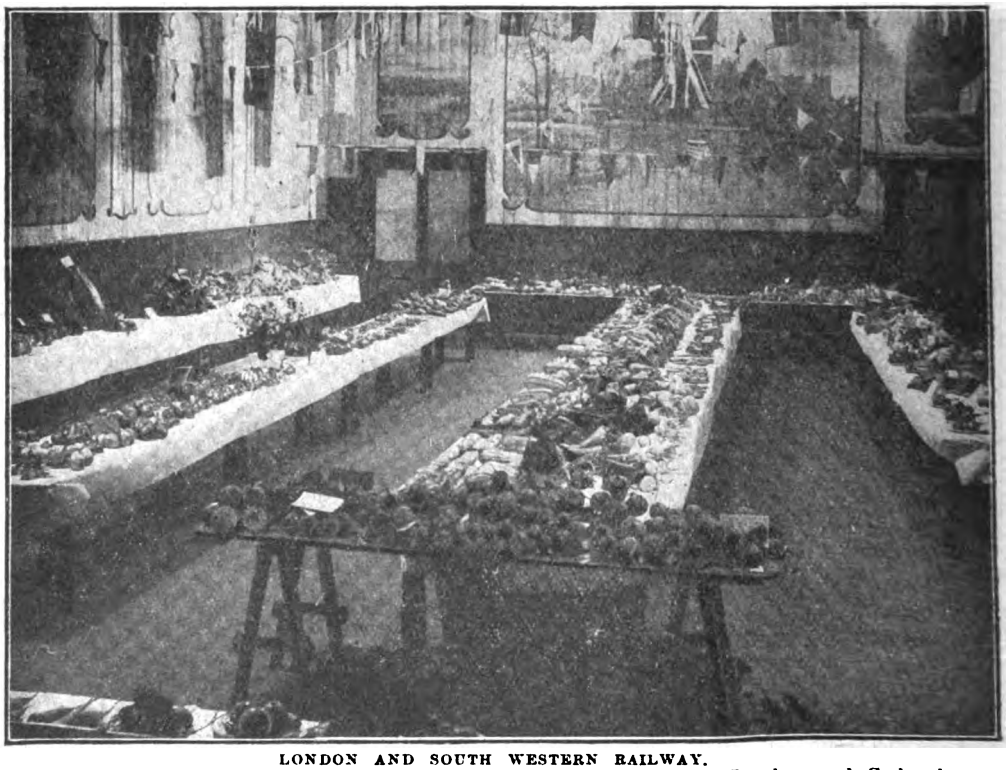
also be made at this point that "lock-and-block" was provided by many companies for securing the safe working of opening bridges. By its use the block system had to be broken down before the movements for opening the bridge could be commenced, and not until the bridge was closed and locked could the block communication be restored. Similarly, after a train had been accepted, and until it had passed out of the section, no steps could be taken to open the bridge. The first bridge that Mr. Sykes interlocked was the Hawarden, and this was followed by others, including the Selby, Keadby, Drax and Newcomen.

Electrically operated signals, worked by small switches, interlocked with the locking frame and so inter-related to the points they controlled and with other signals, were another very beneficial work done by Mr. Sykes. The first were put up at the entrances to Penge Tunnel in 1875, but the first big installation was at the Chatham Railway's Victoria terminus, where, in 1883, 50 shunting signals were erected. These subsequently developed into the well-known banner signals which are to be found on practically every railway in the kingdom. It was these signals that led up to the development of the electro-mechanical system as exemplified, to a remarkable degree, in the large installation at St. Enoch station, Glasgow, of the Glasgow and South Western Railway, and the Victoria station of the London, Brighton and South Coast Railway. At the former there are six signal-boxes, containing an aggregate of 196 point levers and 590 signal slides, a total of 786 units, and at the latter terminus there are also six boxes which contain an aggregate of 176 point levers and 353 signal slides, a total of 529 units. One of the many advantages of this system is the reduced space required; the 100 levers at Clyde Junction, for instance, being contained in a space of 12 ft. 8½ in.

There are many other safety devices, such as replacers, detectors, etc., for which Mr. Sykes was responsible, some of which were first introduced when the Waterloo terminus of the London and South Western Railway was re-signalled in 1892.



LONDON AND SOUTH WESTERN RAILWAY.

The photograph here reproduced illustrates the main section of the London and Suburban Vegetable, Fruit and Flower Show, recently held at Brunswick House, Vauxhall.

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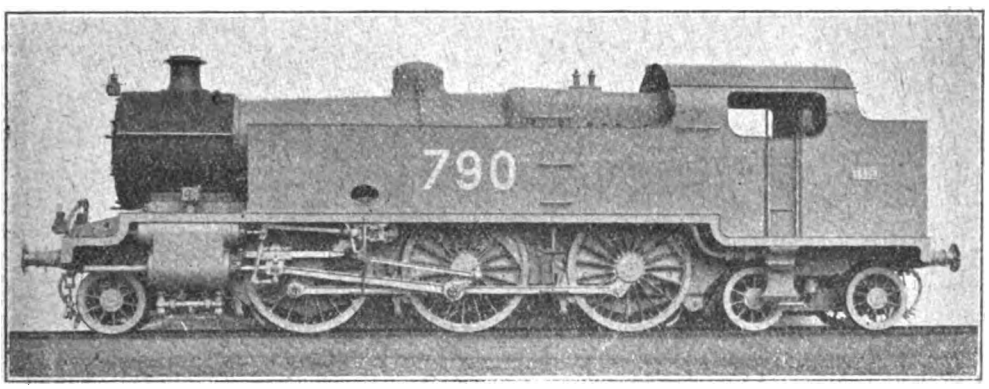
South Eastern and Chatham Railway: New Locomotives.

IT is now nearly four years since Mr. R. E. L. Maunsell succeeded Mr. H. S. Wainwright as Chief Mechanical Engineer, South Eastern and Chatham Railway, but by force of circumstances no new locomotive designs have hitherto been produced by him, though the two engines illustrated date their inception to 1914, the necessities of war having delayed their construction. Now that they have appeared, however, it will be noted that they constitute considerable advances upon preceding classes, while Mr. Maunsell has included a number of more or less notable constructive features. Both engines should find a wide range of traffic for which their respective characteristics peculiarly fit them, seeing that so many sections of the South Eastern and Chatham Railway are difficult to work, and general adaptability is a necessity for most of the engines in service, and the duties hard.

Both engines initiate wheel arrangements not hitherto adopted on the South Eastern and Chatham Railway, and they are largely correspondent with one another, though one is in the form of a tank engine and the other a tender. So far only one of each class has been constructed, and others will be put in hand only when these have been thoroughly tested under service conditions. The two engines are identical in regard to the boiler, cylinders, motion, leading bogies (a Bissel truck of special design), and almost the same frames, while the trailing bogie of the tank engine has features in common with the two-wheeled truck.

A taper boiler turret is used, and the firebox crown slopes downward towards the back, while the sides slope inwards. The steam dome contains a feed heater or purifier, the regulator being placed in the smokebox on the superheater header. The feed appliances include a helical tray without perforations, which delivers the water on to a saddle, and distributes it to both sides of the boiler. It has been found in practice with this device that notwithstanding the hard water found in many South Eastern and Chatham Railway districts, not only is there no deposit on the tray or on the saddle, but that the salts are thrown down as a loose powder which can be readily washed out. The superheater is of standard type, with a cast-iron header, and Messrs. Maunsell and Hutchinson's patented arrangement for permitting the easy removal of elements. There are no dampers. The Bissel truck and bogie are of the Cartazzi slide type, the slides being placed close together, meeting in an apex; the sliding block corresponding. At the sides an oil well is formed for lubrication. In order



SOUTH EASTERN AND CHATHAM RAILWAY: NEW 2-6-4 TANK ENGINE.

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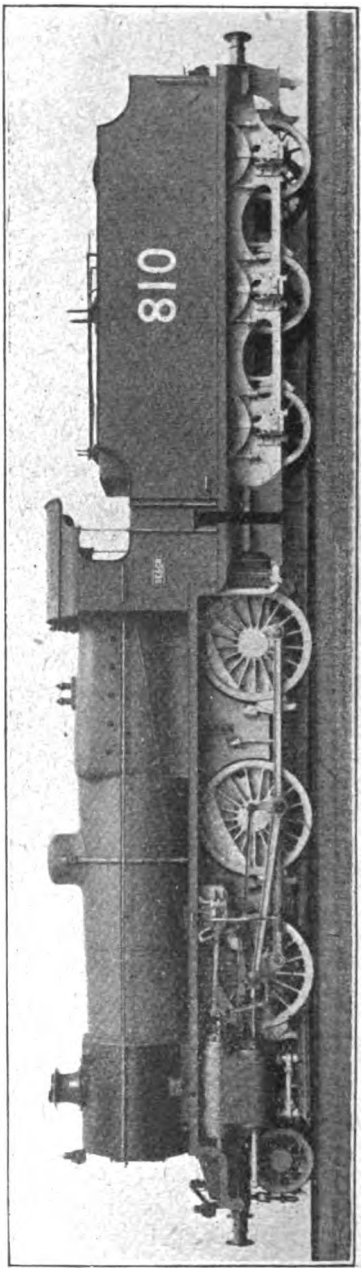
to obtain a simple suitable cylinder casting for either side of the engine, the smokebox is carried on an independent light steel casting resting on the frames instead of on projections on the cylinders. The tender is of standard design, and adapted to be self-trimming. Principal dimensions of these noteworthy engines are as follows :—

2-6-0 TENDER ENGINE—No. 810, CLASS N.

Boiler, working pressure	200 lbs. per sq. in.
barrel dia., front ..	4 ft. 7⅞ in. dia. × 9/16 in.
,, ,, firebox ..	5 ft. 3 in. dia. × 5/8 in.
,, length ..	12 ft. 6 in.
firebox shell, width ..	4 ft. 0½ in.
,, ,, length ..	8 ft.
tubes, 1¾ in. outside dia.	175
tubes, 5⅛ in. outside dia.	21
heating surface, firebox	135 sq. ft.
,, ,, tubes	1,390·6 sq. ft.
,, ,, total	1,525·6 sq. ft.
Superheater (21 elements)	203 sq. ft. (inside)
grate area ..	25 sq. ft.
Cylinders	19 in. dia. × 28 in. stroke
piston valves (inside admission)	10 in. dia.
piston valves, max. travel	6 7/16 in.
Valve motion, Walschaert.	
Wheels, front bogie (Bissel)	3 ft. 1 in. dia.
coupled ..	5 ft. 6 in. dia.
Tractive effort at 80% boiler pressure ..	10·9 tons
Total weight of engine in working order ..	59 tons 8 cwt.
Total weight on coupled wheels	50 tons 18 cwt.
Tender, wheels ..	4 ft. dia.
tank capacity, water	3,500 galls.
coal ..	5 tons
Total weight of tender in working order ..	39 tons 5 cwt.
Total of engine and tender in working order	98 tons 13 cwt.

2-6-4 TANK ENGINE—No. 790, CLASS K.

Boiler, working pressure	200 lbs. per sq. in.
barrel dia., front ..	4 ft. 7⅞ in dia. × 9/16 in.
,, ,, firebox ..	5 ft. 3 in. dia. × 5/8 in.
,, length ..	12 ft. 6 in.
firebox shell, width ..	4 ft. 0½ in.
,, ,, length ..	8 ft.
tubes, 1¾ in. outside dia.	175
tubes, 5⅛ in. outside dia.	21
heating surface, firebox	135 sq. ft.
,, ,, tubes	1,390·6 sq. ft.
,, ,, total	1,525·6 sq. ft.
Superheater (21 elements)	203 sq. ft. (inside)
grate area ..	25 sq. ft.
Cylinders	19 in. dia. × 28 in. stroke
piston valves (inside admission) ..	10 in. dia.
piston valves, max. travel	6 7/16 in.
Valve motion, Walschaert.	
Wheels, front bogie (Bissel)	3 ft. 1 in. dia.
coupled ..	6 ft. dia.
rear bogie ..	3 ft. 1 in. dia.



SOUTH EASTERN AND CHATHAM RAILWAY : NEW 2-6-0 GOODS ENGINE.

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Tank capacity, water ..	2,000 galls.
coal ..	2½ tons
Tractive effort at 80% boiler pressure ..	10 tons
Total weight in working order	82 tons 12 cwt.
Total weight on coupled wheels	52 tons 15 cwt.

Mr. R. E. L. Maunsell, Chief Mechanical Engineer, South Eastern and Chatham Railway, to whose designs these locomotives have been built, commenced his engineering training at Inchicore, Great Southern and Western Railway (Ireland), as an apprentice under Mr. Ivatt. After spending several years there, he joined the Lancashire and Yorkshire Railway, serving first in the works and drawing office at Horwich, and later as locomotive foreman in charge of the Blackpool and Fleetwood district. In 1894 he went to India, as Assistant Locomotive Superintendent of the East Indian Railway, being subsequently appointed District Locomotive Superintendent of the Asansol district. Two years later he returned to Inchicore, as Works Manager, until, on the resignation of Mr. Coey, Mr. Maunsell was appointed Locomotive Superintendent in 1911. In December, 1913, Mr. Maunsell was selected to succeed Mr. H. S. Wainwright at Ashford, South Eastern and Chatham Railway. Mr. Maunsell has taken special responsibilities in connection with the war. He was President of the Institution of Locomotive Engineers for 1916.

REPATRIATED SOLDIERS AT WATERLOO STATION, LONDON.

London and South Western Railway.

Of the multitudinous incidents that have transpired "under the roof" of the new station at Waterloo, none has been more touching than the return of "exchanged prisoners" from Germany recently, when, as already announced in the Press, "about 500 repatriated British soldiers from Germany arrived sunburned and happy. They were received with every care and attention that the Railway Transport Officer and his staff, the officer in charge of the Casualty Branch, and members of the London Ambulance Column and the ladies at the refreshment buffet could bestow upon them." The above illustration of some of the heroes of Mons shows one of the many little attentions bestowed upon these heroes, in the presentation of white heather to the Scottish contingent. The English soldiers received roses.

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PERTINENT PARAGRAPHS

To Our Readers.

A NEW epoch in the history of the RAILWAY MAGAZINE, founded as long ago as July, 1897, as a sixpenny publication, is marked this month, as it has become necessary to advance the price to eightpence per copy and the annual subscription through the post to 9s. 6d. Most monthly magazines made a similar increase several months ago, while many periodicals have doubled their prices.

So far as the RAILWAY MAGAZINE is concerned, the decision has been made with great reluctance, but as the price of paper continues to advance and the cost of every commodity used in the production of the magazine is considerably increased, the proprietors are left with no alternative, and therefore no apology can be necessary. In the case of illustration blocks, expenditure since the outbreak of war, has risen beyond all expectations and if the high standard of the RAILWAY MAGAZINE, as an illustrated monthly, is to be maintained, it can only be done at a much enhanced financial outlay.

Owing to the special restrictions made by the Government and by the wholesale bookselling trade, consequent upon the war, it is urgently recommended that each reader should place a definite order with a newsagent or bookstall manager for the RAILWAY MAGAZINE to be supplied regularly. This will enable the bookselling trade to correctly estimate actual requirements, avoid waste and ensure the prompt delivery of the magazine month by month.

Opportunity is hereby taken to thank the very large number of readers who, during recent months, have written welcome and complimentary letters concerning the monthly bill of railway fare provided in these pages, and likewise for the pæans of praise accorded to the frontispiece plates illustrating engines or trains. These kind and congratulatory communications are particularly encouraging and they are thoroughly appreciated by the management. Readers may rely, no effort will be spared, to maintain the RAILWAY MAGAZINE at the highest possible pictorial level, and further to present month by month the subject to which it is devoted, in such a readable manner that it will continue to receive in the future, as it has done in the past, the intelligent appreciation of a vast army of readers throughout the English-speaking world, to say nothing of the less numerous, but greatly esteemed readers in France, Italy, Scandinavia, Japan and other lands overseas.

More Railways Wanted in South Africa.

IN the October RAILWAY MAGAZINE the excellent governmental report respecting South African Railways was liberally quoted. There is, however, one feature to which lack of space prevented the direction of attention last month, that is well worthy of notice. New developing railways are, Sir William Hoy, the general manager, reports, urgently required in all districts of the Union. It has been necessary in the past to restrict the length of lines constructed in each district, and to distribute the advantages of rail communication as widely as possible throughout the Union. As regards the future, approximately 250 new routes have been surveyed, involving very considerable mileage, and the merits of the different lines are constantly being impressed upon the Government.

Many of the districts requiring railways for the opening up of the country are only partially developed, and that being so, it is essential that such lines be constructed at the lowest possible cost. The lower the cost the greater the mileage capable of being built. All districts demanding railways are in the initial stages prepared to render every possible assistance in obtaining facilities, but the Administration's difficulties commence as soon as Parliament authorises the line, and a start is made with the expropriation of land. There has been, since Union, a welcome change in the attitude of many landowners in this respect, especially in the Cape Province, where the greatest difficulties had been experienced hitherto, but there is still in many cases a disposition to look upon the Administration's needs as an opportune means of making a profitable bargain. The extent to which the value of land is advanced by the presence of a railway is generally overlooked or underestimated.

Other countries have realised the necessity for encouraging the construction of developing railways to open up new country. In Canada and America grants of land are made to the railways, and in certain of the Australian States land must be provided free of charge by the district before development lines are built. In Germany, interested parties must gratuitously give the necessary land for the construction of the line or hand over the requisite means for its acquisition. Local authorities are also required to assist. In Bavaria a stipulation respecting the free provision of land is insisted upon, the local attitude in respect thereto being looked upon as demonstrating the necessity, or otherwise, of the line.

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In some districts in South Africa immediate needs would, it is suggested, be met by better cross-country roads, and by improving the main roads to and from the railway. Bad roads are a frequent source of petition for extended rail communication, and while the railway system of South Africa will have to be extended as soon as funds are available, many of the districts now clamouring for railways will for many years have to provide for long journeys by road to the nearest station. With two exceptions, South Africa has a greater mileage of railway in relation to white population than any other country in the world.

The Line that Rocks the Cradle of the Nile.

FEW railways, the outcome of British enterprise, have appealed more to the popular imagination than the Uganda Railway in British East Africa.

Writing in the *United Empire*, the organ of the Royal Colonial Institute, Mr. H. R. Tate says this far-famed railway "offers the most extraordinary example of the pluck, perseverance and driving force which characterise the British race in its career of colonisation." No RAILWAY MAGAZINE reader, we venture to think, who knows the story of the line will disagree with him. Obstacles — physical, climatic and animal — were encountered at every turn. Waterless stretches of bush and the great Rift Valley delayed construction; malaria and dysentery prostrated Europeans and Asiatics alike; wild beasts ravaged the coolie camps; teredos and termites riddled buildings, bridges and sleepers, but the indomitable courage and doggedness of the chief engineer and his staff "won through" and the railway was completed.

Uganda was the objective of the line, and that Protectorate was entered at mile 365 before the E.A.P. absorbed two provinces of Uganda. Under normal conditions also the Lake steamers receipts comprise nearly 14 per cent. of the total revenue of the railway. When the railway was built, however, there appears to have been little idea of the value, or even existence, of the high temperate region to the east of Lake Victoria, while far more information was available to those at home with reference to the reported richness and fertility of Uganda. Be that as it may, the main railway line does not to-day pass through Uganda but terminates at Kisumu, the capital of the Province of Nyansa.

As regards development, the goods traffic in 1898, when the line was still under construction, was about 5,000 tons; in 1915–16 the figures were 286,591 tons, about 45 per cent. being on account of military traffic and 55 per cent. on account of the general trade of the country. The net earnings of 1915–16, £287,300, represents 4·43 per cent. upon the capital outlay of the railway, and its actual receipts of £634,098 comprised over 54 per cent. of the total revenue of the E.A.P., which amounted to £1,165,561. Once the great war is over and industry is again engaged in peaceful pursuits, a great advance in the development of the territory served by the Uganda Railway may confidently be anticipated.

United States Railroad Hospitality.

SOME five years ago the Interstate Commerce Commission issued an order that the American railroads were to give no free passes to foreign railroads or steamship companies. By reason of this order railroads in the United States were no longer legally able to issue passes to officers visiting America from European or other railways. The order was much resented, not by the visiting officers, but by many Americans, who felt that the honour of the United States as a hospitable nation was at stake. The case was vigorously taken up by Mr. Luis Jackson, and passes were issued in defiance of the order. A law-suit followed. Passes had been issued to representatives of several British railways, and the Interstate Commerce Commission commenced proceedings against the Erie Railroad. The case has been from court to court, but at last the United States Supreme Court has affirmed the decrees of the lower court, making it legal for American railroads to issue exchange passes for representatives of foreign railroads and to steamship companies.

Look Round.

To supplement the ancient proverb "Look before you leap" the London "Safety First" Council has issued a poster advising travelling folk to "Look round." Crossing the crowded streets of London, particularly outside some of the great railway termini at busy times, is an operation requiring no small amount of personal care and circumspection. During the month of September London suffered a much greater number of night air-raids than ever before. Yet the fatalities resulting therefrom numbered only 46—a figure averaging 1 per 100,000 of the population, and far below the monthly average for deaths from street accidents. Again, like the street fatalities, several of the deaths on the occasions of air-raids might have been prevented by the deceased persons taking proper precautions to protect themselves.

A number of leading railway officials are interesting themselves in the "Safety First" movement, and there is no gainsaying that much of the advice given to pedestrians and others in regard to street movements apply with equal, if not greater force, to the approaches of some of the great railway termini in the metropolis. In spite of all precautions, accidents will happen from time to time, but undoubtedly many can be prevented by the use of commonsense and care.

Grimsby Fish.

ALTHOUGH the British may be at the moment the best fed of the belligerent European nations, the food problem is a pressing one, particularly in London and the great industrial centres. In keeping these great hives of human industry provided with food the railways take a leading

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part, and the transport of fish from the port of landing to the home town of the consumer is a case in point.

For generations Grimsby has been noted for its fish, and when the secrets of the war are revealed it will be found the fishermen are equally famous. The calling of a deep-sea fisherman, always hazardous on the stormy North Sea, especially when the bitter winds of winter prevail, is doubly risky in war time, for in addition to the natural difficulties there are now the dangers of submarines and mines to be faced.

Notwithstanding the present additional dangers of the deep, the ships still fishing manage to supply the port with fair regularity, thanks to efficient organisation both within the trade, and in conjunction with the Government, which affords special protection to the fishing boats. Although supplies have diminished in bulk the distribution of the fish covers as wide an area as in mormal times.

London is receiving the lion's share of the Grimsby fish, and as the quantity forwarded is proportionate to what was supplied in pre-war times, we give particulars of the method by which the Great Central Railway ensures this valuable food reaching the metropolis with as little delay as possible.

A fish express runs daily from Grimsby to Marylebone station, London, departing at 5.30 p.m., and arrives at its destination in time to admit of delivery to the early morning market at Billingsgate. The train is classified as a passenger express to ensure there being no delay, and it runs *viâ* Lincoln, Nottingham, Leicester and Aylesbury, the through journey occupying seven hours. The vehicles are fitted throughout with the automatic brake, are specially built for the traffic, and have cement floors. Their weight is about 20 tons, length 46 ft., and each carries about 15 tons of fish. The latest and most up-to-date engines, capable both of great haulage capacity and sustained high speed, are used to work the trains, and the same locomotive takes the train right through to Marylebone. Occasionally when the traffic is heavy the train has to be run in duplicate.

It is most important that the special vehicles used for the fish traffic should be utilised to their fullest capacity, and in order that no delay shall occur after the load has been discharged, the fish empties are in their turn worked specially by express service between London and Grimsby.

Although before the war no effort was spared to work to its destination in the shortest possible time this highly perishable traffic, in order that the fish should deteriorate as little as possible in appearance and quality, the Great Central Railway has, if anything, improved the pre-war arrangements, and in view of the great difficulties which have constantly arisen during the past three years by reason of the shortage of men and materials, the management merits the highest praise for what has been done.

Proposed New Llanidloes Railway.

A SUGGESTION to re-open the railway line from Llanidloes to Llangurig and to continue it as far as Strata Florida, where it would join the Great Western Railway, is again being brought before the notice of the public in the districts concerned. The work, it is pointed out, could be done by German prisoners now in the country consuming food and doing nothing in return.

Writing to the RAILWAY MAGAZINE on the subject our valued contributor, Mr. T. R. Perkins, remarks:—

"You may recollect that—as I explained in my article on the Manchester and Milford Railway, in the RAILWAY MAGAZINE, March, 1906—this is simply a revival of the original scheme of the Manchester and Milford; the portion from Llanidloes Junction to Llangurig was partially constructed and now lies derelict."

"I am very doubtful as to the advantage of constructing the missing link nowadays; neither the Cambrian nor the Great Western would be likely to do so, nor to send their traffic over the route, both of them already having other connections. As for the local traffic, the proposed line passes through an almost uninhabited country and I doubt whether even a Stephens could make it pay."

Lieut.-Colonel Stephens has, indeed, done marvellous things in promoting the prosperity of small railways in Kent, Sussex, Shropshire, Montgomeryshire, and elsewhere, but in view of the poor prospects of the proposed new Llanidloes Railways, perhaps Mr. Perkins is right and even "a Stephens" would find the task beyond his powers.

The Grand Trunk Presidency.

THERE are few more distinguished railway positons on the North American Continent than the Presidency of the Grand Trunk System, from which Mr. E. J. Chamberlin has just retired with a high reputation for all-round efficiency. From the inception of the Grand Trunk in the early 'fifties, through the consolidation of shorter lines between Sarnia on the west, and Riviere Du Loup in Canada and Portland in Maine on the east, the office was for more than half a century filled by the presiding officer of the British board of directors. The line of succession was broken when the late Charles M. Hays was appointed president in 1909, and he held the place until his death in the *Titanic* disaster in 1912. From 1905 Mr. Hays had been president of the Grand Trunk Pacific Railway, then and still a part of the system, and for some time prior to 1912 Mr. Chamberlin, who had retired from the management of the Canada Atlantic, took his place at the head of the subsidiary line. Mr. Chamberlin was Mr. Hays' obvious successor as president of the whole system, and from that he has just retired after five years of assiduous and exacting service.

To the vacancy thus created Mr. H. G. Kelley has been promoted. He has won already a good reputation as an efficient railway administrator, and he has had the advantage of serving under both of his predecessors, latterly in the position

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of president and manager of the Grand Trunk Pacific. Mr. Chamberlin retains his connection with the Grand Trunk Railway System by continuing to serve as a member of the board of directors. Some idea of the importance of the positions filled by these men may be obtained by recalling the fact that the mileage of the Grand Trunk System is now over 8,000. Mr. Kelley has had a long and varied experience as a railway engineer, and he has held since 1907 the position of chief engineer to the Grand Trunk.

Which Railway Introduced the 4-4-0 Type of Passenger Engine?

In regard to a discussion on this point among a party of friends interested in locomotive questions, Mr. J. P. Brierley writes:—

"As far as I can make out, this honour lies with the old London, Chatham and Dover Railway, for in 1862 four engines of this type were built. They had 17 in. by 22 in. cylinders and 6 ft. 6 in. driving wheels, and were numbered 27, 28, 29, 31. Secondly comes the 'Whitby Bogie' class on the North Eastern, the first engine of which class was built in 1864, and thirdly Wheatley's '224' class for the North British Railway (1871). Next in order come Stirling's '6' class for the Glasgow and South Western Railway (1873); Wheatley's '420' class on the North British Railway (1873); Bouch's '1265' class ('Ginx's Babies') for the North Eastern Railway (1874); Drummond's '479' class on the North British Railway (1876); Johnson's '1312' class for the Midland (1876); Connor's '125' class for the Caledonian (1877); and Kirtley's '157' class for the London, Chatham and Dover Railway. Succeeding types until 1880 were Sacré's '423' class for the old Manchester, Sheffield and Lincolnshire Railway (now Great Central Railway) in 1878; Stirling's '19' class for the South Eastern; and lastly Barton-Wright's '629' class on the Lancashire and Yorkshire Railway (1880)."

"Two large railways which are not mentioned in the above list are the London and North Western and Great Western. The first London and North Western 4–4–0's were Webb's four-cylinder compounds of the 'Jubilee' class, the first of which was built in 1897. On the Great Western Railway Mr. Dean's 'Duke of Cornwall' class of 1895 was the first 4–4–0 class. As regards the London and South Western Railway, London, Brighton and South Coast Railway, and Great Eastern Railway, my notes are far from complete and doubtless there are early examples of the 4–4–0 type on these railways, especially on the London and South Western Railway during Mr. Adams' reign."

"The 4–4–0 type, as has many times previously been stated is typical of British locomotive practice, and probably no type of engine is called upon to perform so much hard work, and perform it so well as any reader of Mr. Cecil J. Allen's articles cannot fail to notice."

Mr. Brierley suggests other RAILWAY MAGAZINE readers possessing the required information might be inclined to correct and amplify his notes. In the meantime Mr. Cecil J. Allen supplements Mr. Brierley's records, in that the last engine built for the Stockton and Darlington Railway—No. 160, *Brougham*—was a four-coupled engine with a leading bogie. This locomotive and tender were supplied by Messrs. R. Stephenson and Co., of Newcastle, at a cost of £2,500, in the year 1860, or two years earlier than the engines cited by Mr. Brierley. Three years later (1863) this engine was taken over by the North Eastern Railway, with the rest of the Stockton and Darlington Railway rolling stock, on the amalgamation of the two companies.

Some Recent Railway Accidents.

On June 16th last a goods train was standing at the down goods line home signal at Finchley Road station on the Midland Railway, when it was run into by a second goods train, and two goods guards were killed. The down goods home signal at Haverstock Hill should have been at "danger" against the second train; but whether or not it was is not proved. Colonel Pringle, who inquired into the accident on behalf of the Board of Trade, formed the opinion that the signal was at "clear," owing to the signalman having neglected or forgotten to put the signal to "danger" after the passage of the first train. As the Belsize tunnels come between the two stations named the four lines—two passenger and two goods—are protected by the rotary interlocking block, but this safeguard could not be fully installed as there is no starting or other second signal at Haverstock Hill. Had the system been complete the signalman would have had to put the home signal to "danger" behind the first train, and then the starting signal, before he could lower the home signal again for the second train. The home signal, directly it was put to normal, would become locked, and as it could only be released by the signalman at Finchley Road "accepting" the second train on his block instrument, it follows that the home signal could not have been lowered for the second train. Colonel Pringle therefore recommends that it should be arranged for the home signal to be automatically replaced by the passage of a train, or that the home signal must be at danger before a train can be accepted.

In connection with the railway accident at a military camp in North Yorkshire on September 15th, it is pointed out that the Act of 1842, on which all accident legislation is based, relates to railways "for the public conveyance of passengers." As the railway on which this accident occurred is not used for the public conveyance of passengers the Board of Trade has no power to hold an inquiry into the cause. Notwithstanding, the accident will be reported to the Board of Trade, as section 6 of the Act of 1871, after providing what accidents have to be reported, says that "if the accident happen to a train belonging to any other company such last-mentioned company shall send notice of

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such accident and of the loss of life or personal injury, if any, occasioned thereby to the Board of Trade." As the carriages of the train belonged to the North Eastern, that Company would have to report the accident.

A London to Cambridge express on the Great Eastern Railway had a narrow escape from being wrecked near Angel Road station, Edmonton, on October 3rd. A motor lorry belonging to a private firm was approaching the private crossing from the company's works, when the signal was received by the driver that the line was clear. Just as he drew on to the line he heard the express approaching. He immediately put on full speed and avoided a serious collision, but the rear of the lorry was caught by the left buffer of the engine, and the lorry itself flung over. The driver and his mate were thrown out, but escaped with only a few bruises. The express was pulled up within a short distance of the spot, and few of the passengers knew of the accident.

A verdict of "Accidental Death" was returned at the adjourned inquest at Bere Ferrers, South Devon, on the bodies of 10 New Zealand soldiers who were killed on the London and South Western Railway on September 24th. The evidence showed that the men were travelling in a troop train which was pulled up at Bere Ferrers station, the line ahead being blocked. The soldiers had been told that on arrival at Exeter, which was expected to be the first stop, two men from each compartment were to get out and draw rations from the brake van. When the train pulled up at Bere Ferrers, and almost before it had come to a stand, a number of men jumped on to the line, apparently under the impression that they had arrived at the stopping place of which they had been told. Almost immediately an express from Waterloo to Plymouth dashed through the station and the men on the line were struck down. It was stated that the men got out on the wrong side of the train as on entraining they had entered on the wrong side. The officers and others concerned were exonerated from blame.

Completion of Quebec Bridge.

ENGINEERING features connected with the construction of the new bridge at Quebec have attracted world-wide attention by reason of the difficulties to be overcome and the more than one serious mishap connected with the enterprise. Now the bridge is well on the way to completion interest is centred on its utility, and it is worthy of note that Lieut.-Col. P. Pelletier, Agent-General for Quebec, speaking on the subject has remarked: "The bridge will be of enormous value commercially. It will bring all the south shore railways from New York and the States and from the Maritime Provinces—the Quebec Central, the G.T.R., the Delaware and Hudson, and the I.C.R.—into Quebec, where they will come into contact with the lines on the north shore of the St. Lawrence—the C.P.R., C.N.R., and the Quebec and Lake St. John. The commerce of Quebec must grow as the result, and the port will, of course, greatly increase in importance. The trains on both sides of the river will serve the steamers, and the shipping at the port will increase. Without the bridge the only means of communication is the ferry from Levis. Then, besides bringing trade and consequently labour to Quebec, the bridge will have a great effect on the grain traffic in the winter, as the stuff can now be sent through Quebec to Halifax without being transhipped, instead of going to New York to be shipped to Europe. The more one thinks about it, the greater the advantages one sees that are likely to accrue from the new bridge."

When to Use Trestles.

EVERY country possesses its own peculiar railway problems. In the North American continent one of these appears to be when to trestle and when not to trestle. When to use trestles in making railway embankments and when to raise the track as the fill progresses are questions not to be settled by any general rule, according to the roadway committee's report at the American Railway Engineering Association's last convention. Some engineers, the committee states, consider it almost always preferable to use a trestle, while others would raise the tracks up to 25 ft. or more.

In treating each individual problem, the cost of raising the tracks, it is pointed out, should be carefully figured, including the delays and interference caused to and by traffic (if this exists), and this total should be set against the cost of trestling, including labour and materials. In some cases a run-around, to carry traffic clear of the work, can be made very cheaply, while in others this requires an auxiliary fill or trestle. In estimating for trestles that are not to carry regular traffic, the length of haul is important, because where this is less than two miles light side dump cars may be used and a very light trestle will suffice. Geographical location has an important influence, as climate, character and availability of materials, labour, lumber and other supplies vary enormously in different sections of the country.

British Railways in France.

AFTER the war there will be much to record of the useful work of British railwaymen in the various war areas. From time to time letters arrive from RAILWAY MAGAZINE readers serving with the forces which, as it were, lift the curtain and afford a glimpse of what is being achieved by railwaymen, not only behind, but right in the fighting line.

Writing from France, Mr. Tom Watler, Junr., remarks:—"We often see 'Blighty' engines and trucks on the railways here, which are run by the British R.O.D. It is very interesting in one's travels to notice the many and various types of locomotives and the permanent ways from a one-foot truck tramway to the normal gauge. Railways are our mainstay, and I wish I had the pencil of a ready writer to describe them. On the narrow-gauge lines the engines

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are nearly all Baldwins, exact replicas on a small scale of the mammoth U.S.A. locomotives, and they can pull a fine load. They run very close indeed to the trenches, and in one place where we were, the narrow gauge ran in a wide trench about 12 ft. deep, within 800 yds. of the front line, but, of course, this was an exceptional case. These narrow-gauge railways connect with the main gauge a little way back, and there are hundreds of miles of normal gauge railways worked by the British R.O.D., many of them having been built since hostilities commenced, and I imagine they will be of great service to the French people after the war."

A Long Way from the Station.

A NOVOCASTRIAN reader of the RAILWAY MAGAZINE states that being interested in the question, "Is anywhere in England 10 miles from a railway?" he has studied the subject, and by consulting a map in a copy of "Bradshaw," he has found that there are only two such areas in the country. Curiously enough, he adds, they are at the opposite ends. In Devonshire there is a district round Hartland Point more than 10 miles from Bude or Abbotsham Road stations.

In Northumberland there is quite a large tract of country more than 10 miles from a railway. There is a district this distance away from either the Rothbury terminus of the North British Railway, the Reedsmouth and Riccarton branch of the North British Railway, from any point on the Alnwick and Wooler branch of the North Eastern Railway, or from Jedburgh station in Scotland. The Border goes through this area, which is exceedingly sparsely populated, a good part of it being occupied by the Cheviot Hills. I doubt whether there is a public-house in the whole area. The direct, or Jedburgh, road from Newcastle to Edinburgh passes through the area, but here one has to go 22 miles from one inn to the next, quite a record I should say. There is only one place which can even be called a hamlet in it—Bymess.

Half a century ago it was proposed to bring a line to within about five miles of this district, but the scheme never materialised.

Probably the Devonshire district possesses more villages than the northern one, which is practically all bleak moorland, quite unlike the Northumberland of Tyneside, with its coalfields and shipyards.

Great Western Railway Institution at Swindon.

AMONG the many establishments connected with British railways having for their principal objects the recreation and instruction of the staff engaged in the industry, the Great Western Railway Institution takes a leading place. This Institution comprises lending and reference libraries, central and branch reading rooms, a large hall with stage for dramatic performances, and various recreation rooms. It is maintained by the subscriptions of members, who number at the present time upwards of 11,000 persons. The Institution has been practically self-supporting since its foundation, upwards of 70 years ago.

The library departments now contain about 40,000 volumes embracing standard works in all classes of literature, including natural and applied sciences, the fine and useful arts, travel, history and biography, philosophy, religion and sociology, music, fiction and books for the young. Being a railwaymen's library, it specialises in engineering and railway literature. For a graduated subscription, beginning as low as sixpence a quarter, a member has this fine library and splendid reading rooms at his constant service. Numbers of apprentices, journeymen and their families, draughtsmen and clerks, school teachers and other students are thus afforded unique opportunities which are not neglected. The railway works managers and their staffs also utilise the resources of the library both in their official and private capacities. The library has thus made for itself an important place among the higher educational institutions of the town, and remains the recognised centre of intellectual and recreational activity in the district.

A new edition of the library catalogue has recently been issued. It is a super-royal-octavo volume of 576 pages, printed in long primer and nonpareil type, set solid in double column, sewn on tapes and bound in boards with cloth back and edges cut flush. It is sold to members at eighteenpence, or less than half the cost of production. The work is a dictionary catalogue of the books in the lending and reference libraries, comprising about 40,000 volumes, arranged under authors' names and subject headings in one alphabetical sequence, works of fiction appearing under their authors names only and serious works under both authors and subjects.

Other leading features of the catalogue are its clear typography, the alphabetical sequence being marked by heavy-faced type throughout and the ease of reference, any subject or author being found in its alphabetical place in a moment. It contains helpful cross-references from subjects to allied headings, and hundreds of descriptive notes have been inserted by the librarian to indicate the scope and character of the books in the library. Great credit is due to the librarian, Mr. W. H. Bagguley, for the care and skill demonstrated in the published presentment of his work.

Mr. David Cooper's Jubilee.

To celebrate the occasion of his jubilee of service with the company, the directors of the Glasgow and South Western Railway have presented Mr. David Cooper, the General Manager, with a silver salver, together with a silver tea service and diamond circled watch bracelet for Mrs. Cooper. The salver bears the following inscription:—"Presented by the directors of the Glasgow and South Western Railway to David Cooper, Esq. (along with a silver tea service and diamond circled watch bracelet for Mrs. Cooper),

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on his completion of 50 years of unbroken connection with the Glasgow and South Western Railway. Mr. Cooper joined the clerical staff at Waterside station, Dalmellington, in September, 1867, and passed with distinction through important intermediate offices, becoming general manager of the company in 1894, a position he still, September, 1917, occupies with great ability. During these 50 years the capital and mileage of the company have been greatly added to, involving a corresponding increase of responsibility to the general manager, but during his long tenure of this office Mr. Cooper has discharged all its onerous important duties to the entire satisfaction of the board, and with an earnest and loyal devotion to the company's interest, while his unrivalled knowledge of the company's affairs has, coupled with sound judgment, been of the highest value. Mr. Cooper has taken a notable part in temperance and other movements for the wellbeing of all branches of the Glasgow and South Western Railway employees, by whom he is greatly esteemed for his sympathy, fairness of mind, and unfailing courtesy, a courtesy that from his personal example has permeated all sections and ranks of the company's staff. The directors of the Glasgow and South Western Railway avail themselves of Mr. Cooper's railway jubilee to place on record their high personal regard for him, to acknowledge his good work in the company's interest, and to express their hope that for many years Mr. Cooper may retain the position he now so conspicuously adorns."

Sir James Bell, Bart., Chairman of the Glasgow and South Western Railway's board of directors, in making the presentation, made feeling allusion to the extreme cordiality of the relations that existed between the board and Mr. Cooper, and also alluded to Mrs. Cooper's devotion to her husband's interests.

A portrait of Mr. David Cooper and a lengthy account of his notable career appeared in the RAILWAY MAGAZINE, September, 1917.

Malicious Mischief.

IN the October RAILWAY MAGAZINE reference was made to the mischievous manners of London suburban travellers some fifty years ago. The offences commented upon are now but rarely committed, and likewise the crime of placing obstacles on railway lines, for "the fun of the thing," does not occur frequently: when it does, and culprits are caught, magistrates are not inclined to be lenient.

At Oxted, Surrey, Police Court, recently a boy named Nightingale, aged 12, son of a Limpsfield resident, was charged with endangering the safety of persons travelling on the railway. It was stated that he dropped a stone over a railway bridge as a train from Brighton to London was passing. The stone hit the engine boiler and rebounded through the lookout glass, which was smashed, the fragments falling on the driver, who narrowly escaped serious injury. The engine-driver stated that boys often dropped stones over bridges on trains to see if they could get them into the engine chimney. The boy, who pleaded guilty, was fined £2 and 4s., the cost of the broken glass.

Our New York contemporary, *Railway and Locomotive Engineering*, suggests that the British method of dealing with offenders would do good in the United States of America. Editorially it is remarked:—One of the commonest forms of malicious mischief in this country is that of boys, and even young men, placing upon railway tracks small obstructions such as stones, pieces of wood, splice bars, etc., to see how they will make the locomotive jump. Such acts are not usually dangerous, but they might cause serious damage, and the laws against them ought to be severely enforced. If the Draconian laws in force in Great Britain against such offences prevailed here, amusements of this kind would not be so common as they are. A press despatch recently reported a case where a boy for fun placed a tie on the rails of a well-known railway. The boy was arrested, and when brought before a magistrate was told that he was subject to penal servitude for life for the offence. Owing to the culprit's youth the judge sent him to gaol for a couple of months, and at the end of that time to be given a good flogging with a birch rod.

We once knew of a case in Missouri when a farmer tried to sell a worn-out horse to a railroad company by driving the animal into a cattle guard when a train was approaching. The engineer happened to see the animal in time to stop and thereby spoiled that form of sale. Some of the enterprising farmer's friends were joking about the case and word of it reached the ears of a stationmaster, who reported it to headquarters. This led to the arrest of the farmer, who was prosecuted for endangering trains and passed three months in gaol.

Non-Stop Runs in the U.S.A.

FOLLOWING Mr. Miller's article in the October RAILWAY MAGAZINE, Mr. W. G. Landon, an American subscriber at present serving in the transport section of the French army, writes:—"In regard to American train speeds, mention should be made of the Philadelphia and Reading Railway run, Camden–Atlantic City, 55½ miles, which, in pre-war days, was made by one train in 53 min. or 62·8 miles per hour and by several others in 55. Although such a short run, and slower than it used to be, it still is the fastest in the world."

To Mr. Landon's comment Mr. E. J. Miller, Hon. Secretary of the Railway Club, London, responds that the run mentioned is certainly of special merit, but owing to it being under the 100 mile standard was it not included in the tables compiled by him and published in last month's magazine. Nor was it touched upon in the note upon American Train Speeds, as that was a comment upon the New York–Philadelphia services. It is of interest to remark, says Mr. Miller, that this fast run pointed out by Mr. Landon is also run regularly and no advertisement is made of its accomplishment by the

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Philadelphia and Reading Railway. Mr. Miller also mentions that while this run is the fastest in the world, the fastest run in Europe was that performed by the Northern Railway of France from Paris to St. Quentin, a train covering the 153·1 kilometres at a speed of 61·25 miles per hour, the speed after allowing for "slacks" being approximately that of the U.S.A. example, viz., 62·75 miles per hour.

Early Eastern and Midlands Railway Engines.

In the October RAILWAY MAGAZINE, Mr. H. L. Cottell referred to some engines he observed at Yarmouth in 1881 and asked for information concerning them. These engines, says a correspondent who has made a special study of the subject, would be the 4–4–0 side tanks built by Hudswell, Clarke and Rodgers in 1879 and 1880 for the Great Yarmouth and Stalham Railway. Similar engines were also supplied to the Lynn and Fakenham Railway, and when, in 1883, the Yarmouth and North Norfolk Railway (by which title the Great Yarmouth and Stalham line was subsequently known) and the Lynn and Fakenham Railway were amalgamated and known as the Eastern and Midlands Railway, the latter numbered the seven engines of this class, 8, 9, 10, 19, 20, 40 and 41. They had 4 ft. 6 in. coupled wheels and outside cylinders 16 in. by 20 in., and the cabs were provided with side windows. All these engines, except No. 41, are still at work, though 9A and 20A are on the duplicate list. They were illustrated in the RAILWAY MAGAZINE for September, 1908 (page 220), but the information there given, viz., that they were originally built for a foreign railway, is incorrect (see page 345, October, 1908).

Some 4–4–0 tender engines were also delivered to the Lynn and Fakenham Railway by Messrs. Beyer Peacock and Co. in 1881, and this class continued to be built for the Eastern and Midlands Railway until 1888. These fine engines, which had coupled wheels 6 ft. in diameter and outside cylinders 17 in. by 24 in., were numbered and built as follows:—21 to 24 in 1881, 25 to 28 in 1883, 29 to 31 in 1886 and 32 to 35 in 1888. All are still in service, but have been reboilered in accordance with modern practice. Engines of this class could not have been seen at Yarmouth in 1881, as suggested by Mr. Cottell, because at that date there was no physical connection between the Yarmouth and North Norfolk and the Lynn and Fakenham Railways. The former line reached North Walsham from Yarmouth in June, 1881, but it was not until April, 1883, that the Lynn and Fakenham Railway's extension from Melton Constable to North Walsham was opened.

Irish Convention Special Train, Cork to Dublin.

In connection with the Irish Convention a special train was recently arranged for the conveyance of the members to and from Cork on the Great Southern and Western Railway.

The up special by which the party returned to Dublin on September 27th *en route* for Belfast was the fastest train yet run on any of the Irish railways. It was hauled by locomotive No. 328, one of the "321" class engines built in 1905, and there were six vehicles, the composition of the complete train being as follows:—

	Weight. T.	C.	Q.
Engine, No. 328	52	14	0
Tender	36	2	0
Six-wheeled van, 30 ft. long ..	15	2	0
First-class corridor saloon, 45 ft. long	22	7	3
First-class corridor saloon 45 ft. long	23	11	1
Dining saloon, 57 ft. long ..	33	2	2
First-class saloon, 50 ft. long..	27	18	3
Six-wheeled van, 30 ft. long ..	15	2	0
Total	226	0	1

Leaving Cork at 3.0 p.m. the train arrived at Thurles at 4.16, after covering the distance of 79 miles in 76 min. The fastest portion of this part of the journey occurred between Limerick Junction and Thurles, where the speed attained an average of over 74 miles per hour. A stop was made at the last-mentioned station to set down members of the Convention, and the journey was then resumed at 4.26 p.m. An average speed of 60 miles per hour was maintained as far as Ballybrophy Junction. The rate then increased to over 64 miles per hour, due to the falling gradient to Mountrath. The highest average speed was attained between Maryborough and Portarlington, where it reached 75 miles per hour. A check to 60 miles per hour then took place as the rising gradient to Kildare had to be climbed. From Kildare to Dublin the gradient profile, with one or two brief rises, shows a fall, and the speeds recorded were 68 and 72 miles per hour between Kildare and Sallins, and Sallins and Island Bridge Junction respectively. Steam was shut off at Clondalkin, 4½ miles from Dublin, and Island Bridge was passed at 5.45 p.m.

The final portion of the journey occupied some 9 min., as the train skirted Dublin on the North Wall extension and Amiens Street loop line. The speed restrictions at Island Bridge Junction and over the North Wall Branch entailed a drop in the speed of the train to 33·3 miles per hour, Amiens Street station being reached at 5.54 p.m., or 174 min. from the time of starting. Deducting the 10 min. stop at Thurles, the actual running time occupied in the 165 miles' journey to Island Bridge was 155 min.

The various average speeds, and the relative distances between the principal stations shown on a chart prepared by Mr. E. A. Watson, the Company's Chief Mechanical Engineer, proves that the average speed from Cork to Amiens Street exclusive of stop was 62 miles per hour.

Upon the arrival of the train at Amiens Street the members of the Convention changed into the special coaches provided for them on the 6.30 p.m. ordinary express to Belfast on the Great Northern Railway.

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We reproduce a photograph of Lieut. John G. Waldie, Royal Highlanders (Black Watch) and Machine Gun Corps, who has been killed in Flanders. His age was twenty-six, and he was the only surviving son of Mr. William Waldie, Traffic Superintendent for Scotland of the East Coast Railways (Great Northern and North Eastern), Glasgow. Lieut. Waldie served his apprenticeship as a railway engineer in the chief engineer's office of the North British Railway, Edinburgh, and previous to joining the Army, shortly after war broke out, was employed in the office of the district engineer of the Great Northern Railway at Leeds.

* * *

Mr. D. W. Barrie, who has been appointed District Traffic Superintendent of the Caledonian Railway at Dundee, in the place of Mr. George Harvey, who has received an appointment under the Coal Controller, took up his new duties early in October. Mr. Barrie, who is a native of Monikie, has had a wide experience of railway work. Beginning his career in 1891 at Leysmill, he later served at Guthrie, Forfar, and other stations, including Perth, where he was stationed till 1910, when he was appointed Advertising Agent at Glasgow. When Mr. Robert Killen was appointed Superintendent of the Line last year Mr. Barrie was appointed one of his assistants.

* * *

Mr. Henry Turner, the Horse Superintendent of the London and North Western Railway, has recently been given the Freedom and Livery of the City of London through the Court of the Worshipful Felt-makers. Previous to entering the railway service, Mr. Turner had extensive veterinary experience as a pupil, and afterwards as assistant to the late Mr. H. Olver, F.R.C.V.S., of Tamworth. In 1880, he became assistant to the late Professor William Pritchard, a President of the Royal College of Veterinary Surgeons in London, and took charge of the Midland Railway horses in London. In November, 1881, he was transferred to the London and North Western Railway, as assistant to the late Captain Barthorp, whom he succeeded as Chief of the Horse Department in October, 1905.

* * *

Mr. Michael O'Neill, who retired in 1914 from the position of Audit Superintendent of the Midland Great Western Railway, died recently and his funeral took place at Glasnevin on October 3rd. The railway was represented by Major Cusack (Chairman), Mr. P. A. Hay (Secretary), Mr. Wm. Smyth (Accountant), Mr. J. C. O'Reilly (Cashier), Mr. Robert Mottershed (Storekeeper) and Mr. John Dowd. The Irish Railway Clearing House was represented by Mr. J. Ingram (Secretary).

LATE LIEUT. JOHN G. WALDIE.

* * *

Major-General O'Callaghan, in a recent letter to *The Times*, suggested that during an air raid the tube railways might prove a veritable death-trap in the event of the ventilating apparatus being put out of action by a bomb. Our contemporary states that it has received numerous inquiries regarding the possibility of such an accident, and as a result has obtained the following statement from the engineer to the London Electric Railway Company:—"We are unable to anticipate any condition which will render the air in the tube railways unsafe The tube railways ran for a number of years without any artificial ventilation whatever. There is very considerable ventilation caused by the motion of the trains in the tunnels—quite

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sufficient in itself to prevent the air becoming unpleasant. The shutting down of the whole of the electrical supply on the London Electric Railways would not affect the running of the fans in that we have an alternative means of power supply from a quite independent source. Individual damage to one station, or one fan, would only put that fan out of commission and the fans at adjacent stations would keep the ventilation going."

* * *

SINCE his appointment to his present post, Mr. Edward Hume Townshend, Rugby Divisional Engineer, London and North Western Railway, has in connection with the war been overseas in charge of civilian companies of platelayers. In 1894 Mr. Townshend was Assistant to the County Surveyor of County Cork, and during the next six years he had extensive experience of constructional work in various parts of Ireland. He became an A.M.I.C.E. in 1900, and was appointed to the Staff of the Congested Districts Board in that same year. Two years later he was a contractor's engineer on the Thirlmere Scheme of Waterworks for the City of Manchester, and in 1904 was engaged on harbour works at Newcastle, County Down. On March 15th, 1906, he joined the service of the North London Railway as Assistant to the Engineer, and remained there until December, 1909, when he was appointed Resident Engineer on the Croxley Branch, and the widening of the Rickmansworth Branch. On the completion of these works, in March, 1913, he was transferred to Nuneaton, where he took charge of the work of enlarging that important station, and on the retirement of Mr. Farr, last year, he was appointed Divisional Engineer of the Rugby Division.

* * *

THE EARL OF BESSBOROUGH, Chairman of the London, Brighton and South Coast Railway, has presented six members of the Company's staff and a member of the South Eastern and Chatham Managing Committee's staff with rewards for courageous and prompt behaviour in dealing with a fire which broke out in a train in September.

* * *

MR. W. E. DUPEROW, Assistant General Passenger Agent, Grand Trunk Pacific Railway, Winnipeg, has been appointed general passenger agent of the Grand Trunk Pacific and Canadian Government Railways, with headquarters at Winnipeg.

* * *

MR. W. ROWED'S retirement as Plymouth Divisional Superintendent, Great Western Railway, has been marked by the presentation to him of a number of valuable gifts subscribed for by between 300 and 400 persons. Mr. H. Tucker presided at the presentation, which was made by Mr. J. Nicholas.

* * *

AT the Railway Mechanics' Institute, Horwich, Lancashire and Yorkshire Railway, the technical school winter session 1917–1918 has commenced. The subjects range from mechanical engineering to sick nursing and competent instructors are engaged for all the courses. Sir John A. F. Aspinall is the president of the Institute, which for a long course of years has been the centre of a very useful sphere of activity. Sir George Armytage, Bart., will give a prize value two and a half guineas for the engineering student employed by the Lancashire and Yorkshire Railway who in the judgment of the Committee makes most progress during Session 1917–1918.

* * *

IT is stated a new line of railway, to be constructed for the development of the ironstone industry in the district, will run through the site of the Battle of Edge Hill, near Banbury. The cost is estimated at £140,000.

* * *

THE management of the London Underground Railway has written to the Commissioner of Police expressing warm appreciation of the valuable services rendered by special constables during the recent raids, when the public in large numbers had sought security in underground shelters. This work of the Specials had lightened the task of the railway officials, which has been especially arduous, and at times of a disagreeable character. The work has been carried out with great courtesy and kindliness, write the Underground Railway authorities.

* * *

A LIST is published of the best kept stations on the Caledonian Railway, with the names of the agents, which have gained the highest percentage of marks entitling them to premiums. They are divided into four classes. Stations which had previously won premiums for a certain number of years in succession were debarred from competing this year. First class premiums (20 stations), £5 each, were awarded to the under-mentioned :—Crieff—William Millar ; Dubton—William C. Smith ; Alyth Junction—James Laing ; Coulter—William M'Rae ; Barnhill—John Cameron ; Colliston—George M'Laren ; Paisley (St. James's)—Robert Nicholson ; Farnell Road—A. G. Thomson ; Thornton Hall—James Stott ; Laurencekirk—David Whitlaw ; Wemyss Bay—John Thomson ; Comrie—Peter Taylor ; Clarkston—William Walker ; Mount Vernon—Dun. Campbell ; Auchterarder —Thomas M. Roy ; Forfar—William Hamilton ; Airth—Alexander Petrie ; Friockheim—Andrew Grant ; Guthrie—David Smyth ; Liff—Alexander Rae.

* * *

AT the October meeting of the Railway Club, 92, Victoria Street, London, S.W., under the presidency of Mr. J. C. Cosgrave, a paper was read by Mr. A. W. Bartlett, entitled "The Drummond Express Locomotive of the London and South Western Railway." The lecturer noted the more important classes of tender engines built by Mr. Drummond and those afterwards rebuilt by Mr. Urie, who succeeded him as Locomotive Superintendent. Some of the special features of locomotive construction

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by Mr. Drummond were instanced, such as the cross water tubes in the fireboxes, the large 8-wheel bogie tenders holding the large quantity of 5,800 gallons of water and the extensive use of feed water. The work of the several classes of locomotives was reviewed by instances of personal observation by the author, and the merits and demerits of the same explained. The paper was illustrated by a large number of photographs and a summary of the leading dimensions of the engines dealt with was presented to the members.

* * *

WRITING from Wellington College, Mr. A. G. L. Maclean remarks:—"Several Caledonian Railway engines which have been repaired in England have left home painted the standard blue and returned painted black, for example, No. 912 4–6–0; and on the other hand a 0–6–0 tank mineral engine went to Stratford the standard black and returned painted blue, the engine in question being No. 240. I might add that concerning Mr. Pickersgill's new 4–6–2 superheater tank engines four of them are stationed at Beattock for assisting trains up the bank and the remainder are used chiefly on passenger traffic between Glasgow and Greenock. They number from 944 to 953 inclusive."

* * *

FROM Edinburgh Mr. C. C. Littlejohn writes: "I was interested in Mr. Purdom's photograph on page 284 of the October RAILWAY MAGAZINE, showing a North Eastern engine (No. 1396) on a Highland Railway goods train in Pitlochry station, as during a six weeks' stay at the latter resort this summer I saw this engine on numerous occasions, also its sister-engines, Nos. 1404, 202, and 636, and Caledonian No. 560 and North British No. 614, all of the 0–6–0 type, and which have been hired by the Highland. They gave Pitlochry station quite a cosmopolitan appearance at times: thus one morning I saw two goods trains cross each other; the north-going train had one of the North Eastern Railway engines attached and the south-going train was hauled by the North British engine just mentioned. Another goods which I saw going south was double-headed, having a North Eastern 0–6–0 piloted by a Highland 4–6–0 with Louvre funnel, which combination looked rather odd. The 'foreign' element showed itself in coaching stock as well as locomotives, as I saw Great Western corridor carriages next to an old-fashioned Highland 'coupe' 'first' on the 9.30 a.m. 'Mail' *ex*-Inverness one day, and the 3.30 p.m. *ex*-Inverness had a Glasgow and South Western Railway sorting carriage attached every night. The 'pooling' of goods wagons, however, afforded, perhaps, the greatest variety of stock. I saw many trains of from 20 to 40 wagons comprising vehicles of almost every important British railway company, including such systems as the Furness, Hull and Barnsley, etc., conveying purely local traffic in many cases and with, perhaps, only two or three Highland wagons amongst them. Indeed, I noticed one north-going train of about 25 wagons, every one of which, with the exception of the brake van, was 'foreign' and hauled by a North Eastern engine! At the time it struck me as being unique, but other readers of the RAILWAY MAGAZINE have recently furnished numerous similar instances of 'mixed' trains arising out of the present war-time conditions."

* * *

AT Kettering the Midland Railway Rifle Club is well maintaining its position. A large number of its members having joined the colours, the committee, to fill up the vacancies, hit upon the idea of introducing the new element of labour which has come so prominently to the fore during the war into its membership, and the women have proved themselves quite adepts in the use of the rifle. During the last few months other clubs on the system have admitted women to membership.

* * *

THE Railway Executive Committee has informed the National Union of Railwaymen that the Director of Recruiting has agreed that until further notice skilled men from railway shops notified to the War Office for release, who are not required for mechanical or craftsman's work in the army, will be returned to the railways, and will not be posted for combatant duties in line regiments.

* * *

IT is now confidently stated that the Controller of Coal Mines had a sufficient number of railway and privately-owned coal wagons at his disposal by October 15th to remove all ground for anxiety about the conveyance of coal from the collieries to the various depôts established throughout the country. In this work the Controller has had the loyal co-operation of all the railways.

* * *

IT has been announced by the Secretary of the Mercantile Marine Service Association that the recent efforts to obtain reduced fares and the issue of free railway passes to merchant seamen (masters, officers and all members of the crew) having reached a satisfactory conclusion, details of the new scheme have now reached him from the Board of Trade, which, briefly, are:—When a ship has been diverted by order of the competent naval or transport authorities to some port or other than the port at which the crew would ordinarily have been discharged, the seamen will be entitled to travel free to the latter port from the port of discharge, special warrants being issued for this purpose. Seamen of vessels other than those referred to above who desire to travel to their homes on their discharge will be entitled to tickets at a reduced rate—that is, two-thirds of the present fare. Special vouchers will be issued, which must be presented at the railway booking office at least 15 minutes before the train is due to start. Seamen availing themselves of the facilities given under transmission of wages scheme will, in future, be charged railway fare at the old rate (without the 50 per cent. increase).

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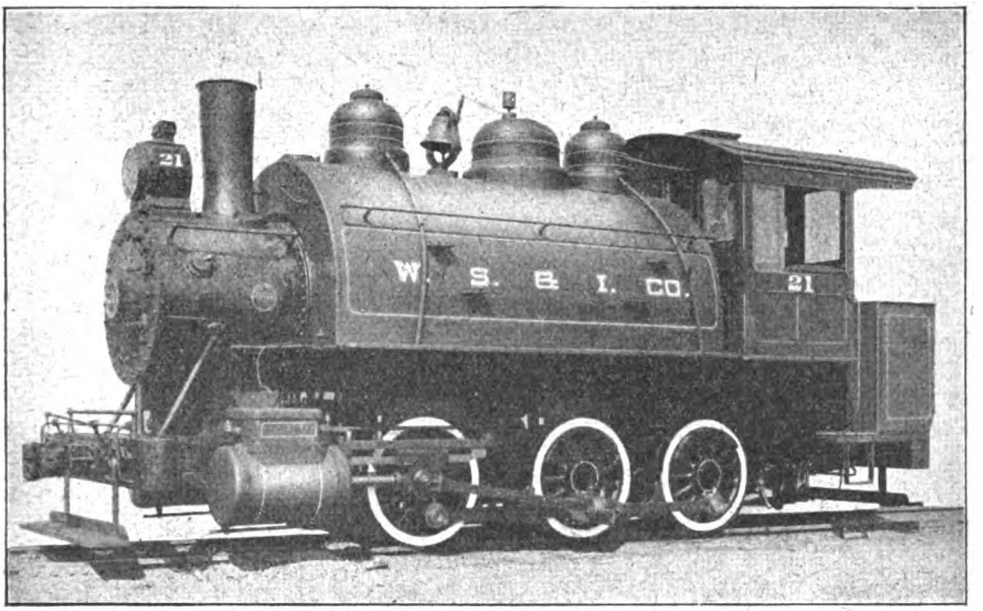

(1) SIX-COUPLED TANK LOCOMOTIVE: THE WHEELING STEEL AND IRON COMPANY.

Recent American Locomotives for Switching Service.

DURING the past few years, American railways and locomotive builders have given much attention to the design and construction of locomotives for switching service. Owing to the use of heavier and more efficient motive power, freight trains have steadily increased in weight, and the requirements of switching service have become more and more exacting. These demands have usually been met by the enlargement and improvement of existing types, although in certain instances new wheel arrangements have been introduced in order to meet unusual requirements.

In some cases, heavy switching in terminal yards is being done by locomotives formerly used in road service. Comparatively few road engines, however, are suitably proportioned for work of this character, and many have wheelbases which are too long for the sharp curves encountered in yard work. Locomotives of the Consolidation (2–8–0) type, originally designed for heavy road service, have probably been relegated to switching service more frequently than any others. In some cases, the front bogie has been removed; while occasionally a more extensive reconstruction has been undertaken, and the rear pair of coupled wheels has also been removed, the resulting wheel arrangement being 0–6–0. Such a locomotive, however, has an excessive overhang at the back end; and an even weight distribution is difficult to obtain. This plan has, therefore, been carried out in comparatively few cases. The switchers now used in heavy terminal and industrial service, have as a rule been specially designed for the requirements.

Switching locomotives are usually built without either front or rear bogies, in order that the entire weight of the engine may be available for adhesion. In accordance with American practice, the loads carried by the coupled wheels are equalised in such a way as to obtain the equivalent of a three-point suspension system. In a six-coupled locomotive, for example, the second and third pairs of wheels have an independent equalisation system on each side, thus giving what is practically two points of support. The third point is obtained by cross-equalising the springs over the first axle, and supporting

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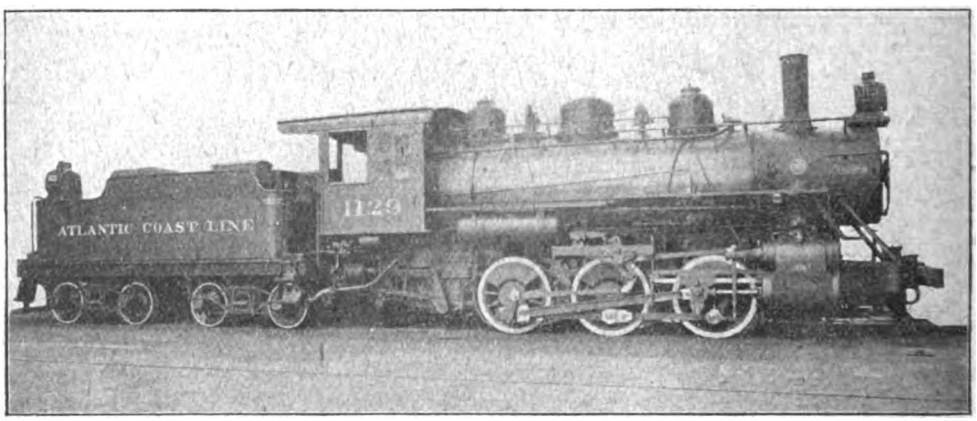
the locomotive frames from the middle point of the transverse beam. Locomotives so constructed ride well on poorly surfaced tracks, and even with a short wheelbase and considerable overhang, are safe to operate at the moderate speeds required in switching service.

The use of tank engines for heavy switching work is not as common as it was some years ago. This is because the switcher has grown in size to such an extent, that the necessary supply of fuel and water cannot be carried on the engine without either using excessive wheel-loads, or restricting the boiler dimensions to a prohibitive degree. With a separate tender, the designer can supply the necessary boiler power in combination with large fuel and water capacity. This reduces the number of trips that must be made to the water tank and fuel bin, thus saving valuable time.

The use of superheated steam in switching locomotives, while not as common as in road engines, is steadily increasing; and many of the large switchers now built are equipped with superheaters. The use of the Schmidt design is practically universal. Although the work of a switching locomotive is exceedingly intermittent, it is found that the superheater effects a material saving in fuel and water consumption, makes the engine "smarter," and, because of the reduced demand on the boiler, makes it easier to avoid black smoke. The superheater locomotive, moreover, is less liable to discharge water and wet steam from the stack. This advantage is most apparent in switching about passenger stations.

Many switching locomotives recently built are equipped with power reverse gears. This device not only saves the engineman a considerable amount of labour, but also makes it possible to reverse the locomotive more quickly; and the engineman can do this while keeping his head out of the cab window watching for signals and car movements.

The special equipment of switching locomotives, including such devices as couplers and air brakes, is of course selected to suit the conditions under which the engines are to operate. The use of air sanders is practically universal. Rail conditions in terminal yards and industrial plants are often bad, and effective sanding equipment is important if the locomotives are to move heavy loads promptly. Another item, which on account of the nature of the service, requires special attention on a switching engine, is the arrangement of steps and hand-holds. These fittings are located in accordance with government regulations.



(2) SIX-COUPLED SWITCHING LOCOMOTIVE: ATLANTIC COAST LINE.

The accompanying illustrations represent a number of switching locomotives recently built by The Baldwin Locomotive Works. These engines were all designed for heavy service, and none having less than three pairs of coupled wheels is included among them.

Fig. 1 shows a tank locomotive of the 0–6–0 type, built for the Wheeling Steel and Iron Co. This engine, although used in industrial service, is an excellent example of a design that is suitable for general switching purposes where a tank engine will serve. The weight of the locomotive in working order is 132,100 lbs., and the

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tractive force developed is 28,800 lbs. The tank capacity is 2,250 U.S. gallons, and 2 tons of coal can be carried in a coal-box placed back of the cab. With the tank nearly empty, the adhesion ratio is approximately 4.

The cylinder dimensions are 19 by 24 in., and the steam distribution is controlled by balanced slide valves which are driven by the Stephenson link motion. The coupled wheels are 46 in. in diameter, and in this case the middle pair is the main pair. These wheels have plain tires, to reduce friction when traversing sharp curves.

The boiler, as is usual in American practice, is built of steel plate throughout, including the inside firebox. The foundation ring is placed on top of the frames, and over the rear coupled axle. The firebox contains a brick-arch, which is supported on studs tapped into the side sheets. A steam pressure of 180 lbs. is carried.

This locomotive is fitted with an equalised steam brake, having shoes on all the wheels. Service conditions are such, in this case, that air brake equipment is not required.

The locomotive for the Atlantic Coast Line, represented in Fig. 2, is the most recent development of a type that has done excellent work on this road in general switching service. This engine weighs, in working order, 129,250 lbs., while the tender, fully loaded, weighs about 65,000 lbs. additional. The tractive force developed is 32,600 lbs., so that the weight on the coupled wheels is utilised to full advantage.

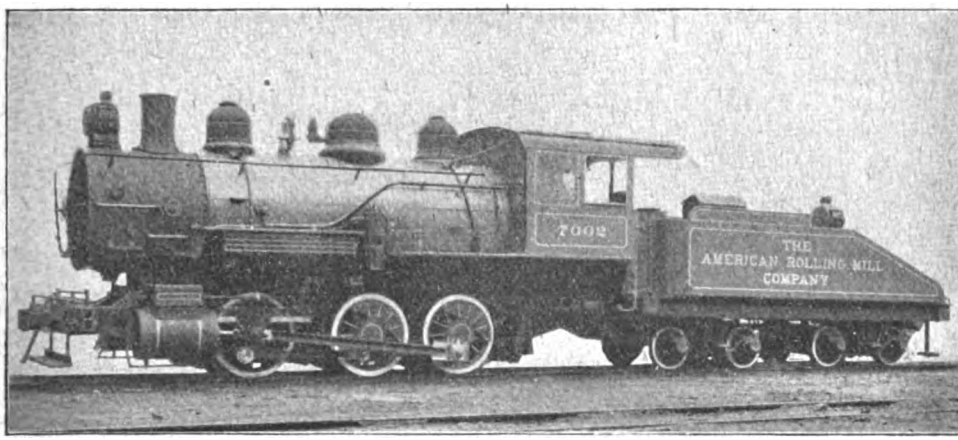
This locomotive, although not particularly heavy, is a highly developed machine for switching service, as its equipment includes a superheater, fire-brick arch supported on water tubes, piston valves, Walschaert's valve motion, and power reverse gear. The last-named device is of the Ragonnet type, and is operated by compressed air. The air cylinder is placed on the right-hand side of the boiler, and the piston is connected to the lift shaft by a short reach rod. A small hand lever, conveniently placed in the cab, controls the mechanism.

This locomotive is designed to operate on curves of 100 ft. radius, and the wheelbase is comparatively short (10 ft. 6 in.). The rear pair of wheels is therefore made the main pair and room is thus secured for a long main rod and a satisfactory design of valve gear.

The boiler has a diameter at the front end of 58 in., and the firebox is placed on top of the frames, with the front end of the foundation ring above the rear coupled axle. All seams in the inside firebox are electrically welded, as is also the seam around the fire-door opening; and the tubes are welded into the back tube-sheet. This method of construction has been extensively used on the Atlantic Coast Line, with most satisfactory results. The working pressure, in this case, is 200 lbs. per sq. in.

The cylinders are 20 in. in diameter by 24 in. stroke, and the piston valves, which are arranged for inside admission, are 9½ in. in diameter. The coupled wheels have a diameter of 50 in.

The tender, as is usual in American practice, is carried on two four-wheeled bogies. The tank has a straight top, and its



(3) SIX-COUPLED SWITCHING LOCOMOTIVE: THE AMERICAN ROLLING MILL COMPANY.

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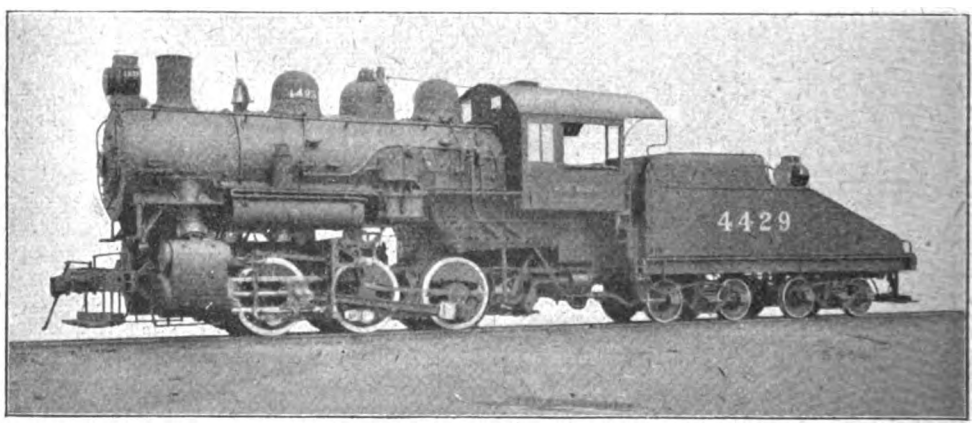
capacity is 3,000 U.S. gallons of water and 6½ tons of fuel.

Fig. 3 represents a straight-forward design of heavy six-coupled switcher, which is built for the most severe class of industrial service. This locomotive weighs, exclusive of tender, 137,900 lbs., and develops a tractive force of 35,000 lbs. It has 21 by 26 in. cylinders and coupled wheels 50 in. in diameter, and the boiler carries a working pressure of 180 lbs. In service the locomotive operates on curves of 170 ft. radius.

This engine uses saturated steam, and is equipped with balanced slide valves and Stephenson link motion. The pistons are connected to the third pair of coupled wheels. Simplicity of construction characterises the design throughout, and the locomotive is well fitted for the severe conditions under which it must operate. The tender is built with a sloping back tank, in order to give the engine crew a good view when backing up. The capacities for coal and water are 6 tons and 4,000 U.S. gallons respectively, and the tender, loaded, weighs about 80,000 lbs.

The boiler has a straight top and a wide firebox, with the front end of the foundation ring placed immediately over the third, or main, pair of coupled wheels. By placing the centre line of the boiler at a height of 9 ft. 2 in. above the rail, space is secured for a sufficiently deep furnace throat. The superheater has 28 elements, and the superheated section of the smoke-box header is connected with the steam chests by pipes which pass out through the sides of the smoke-box. This gives a connection which is as short as possible, and is free from abrupt bends. The use of outside steam pipes is practically universal on superheater locomotives in the United States.

The height of this locomotive to the top of the stack is 15 ft. ½ in., and the width overall is 10 ft. 3 in. These measurements approximate those of the majority of locomotives used in the United States, although in some instances they have been exceeded.



(4) SIX-COUPLED SWITCHING LOCOMOTIVE: UNION PACIFIC RAILROAD.

Fig. 4 shows a well-developed design of six-coupled switcher for the Union Pacific Railroad. This locomotive weighs, without its tender, 156,300 lbs.; and with 21 by 26 in. cylinders, coupled wheels 51 in. in diameter, and a steam pressure of 180 lbs., it develops a tractive force of 34,400 lbs. Superheated steam is used and is distributed by inside admission piston valves 12 in. in diameter, which are driven by Walschaert's motion. The coupled wheels are grouped on a wheelbase of 11 ft., and all the tires are flanged.

The tender of this locomotive weighs, loaded, about 90,000 lbs., and carries 4,500 U.S. gallons of water and 6 tons of coal. The tank has a sloping back, and the fuel space is built with a sloping floor, so that the coal is shaken forward where it is within easy reach of the fireman.

A heavier locomotive similar in general design to the Union Pacific engine, and built for industrial service at the Ohio Works of the Carnegie Steel Co., is shown in Fig. 5. The weight here reaches the high figure of 177,650 lbs. for the engine alone, or of approximately 290,000 lbs. for the engine and tender. With cylinders 22 in. in diameter by 28 in. stroke, coupled wheels 51 in. in diameter, and a working steam

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pressure of 190 lbs., the tractive force exerted is 42,900 lbs. The locomotive is so designed, however, that a pressure of 200 lbs. can be safely carried if desired.

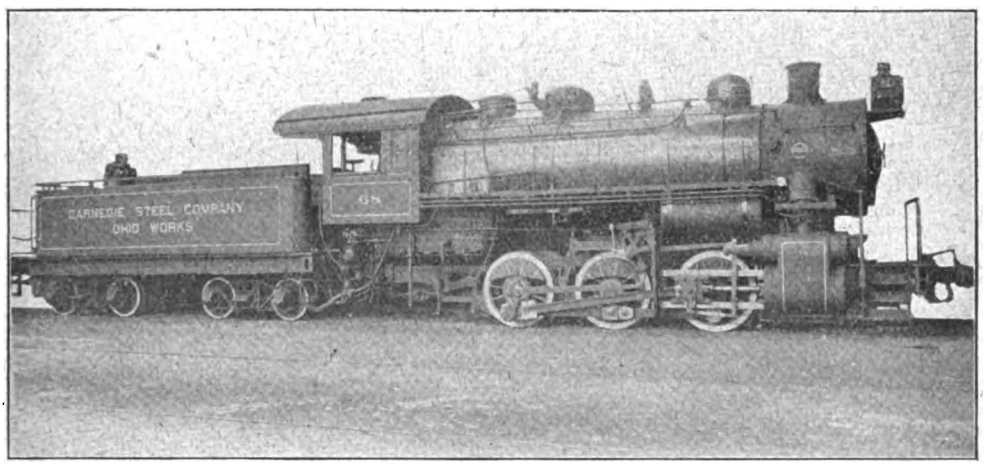
The boiler has a wide firebox, which is placed back of the coupled wheels and provides a grate area of 38·9 sq. ft. A 28-element superheater is applied, with a superheating surface of 505 sq. ft.; while the water heating surface is 2,176 sq. ft. These figures indicate high steaming capacity, fitting the locomotive for service where high tractive force must be developed for considerable periods of time.

The steam distribution is controlled by inside admission piston valves, which are 11 in. in diameter, and are driven by Walschaert's motion. The Ragonnet power reverse mechanism is applied, and is so arranged that it can be operated by either steam or air. The coupled wheels are grouped on a wheelbase of 11 ft., and all the tires are flanged; sufficient play being allowed between rails and flanges to enable the locomotive to traverse curves of 150 ft. radius. All the wheels have centres of cast steel. The piston heads are of rolled steel, with bearing rings of gun iron bolted on.

The tender is carried on rolled steel wheels, and has a strongly built frame consisting of longitudinal channels and cast steel end bumpers. The tank has a straight top, and carries 5,900 U.S. gallons of water and 6 tons of fuel.

Fig. 6 represents an eight-coupled locomotive for the Duluth, Missabe and Northern Railway, which develops a tractive force of 49,700 lbs. and weighs, exclusive of tender, 216,000 lbs. This type is suitable for service where wheel-loads are limited, or where, even with heavy wheel-loads, a six-coupled locomotive would not develop sufficient tractive force. Such conditions are often found in "hump" yards, where trains are pushed up one side of the hump and the cars then roll down by gravity into the classification tracks on the other side.

The Missabe locomotive uses superheated steam, and has a wide firebox boiler of large capacity, carrying a pressure of 185 lbs. A conical ring is used in the front half of the boiler barrel, and this provides ample steam space above the firebox and also a sufficient depth of water under the tubes. The superheater elements are 34 in number, and they



(5) SIX-COUPLED SWITCHING LOCOMOTIVE: CARNEGIE STEEL COMPANY.

are placed in 5½-in. tubes which are welded into the firebox tube-sheet.

Machinery details include inside admission piston valves, 12 in. in diameter; Walschaert's valve gear, and the Ragonnet power reverse mechanism. The piston heads are of rolled steel, and the piston rods of heat-treated carbon steel. Flanged tires are used on all the coupled wheels, and flange oilers are applied to the front and rear pairs. The cylinder dimensions are 24 by 28 in., and the coupled wheels are 51 in. in diameter.

The equalisation system divides between the second and third pairs of coupled wheels, and the locomotive is cross-equalised in front so that the equivalent of a three point suspension system is secured. The frames and structural details are strongly designed

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throughout, and the locomotive is well fitted for severe service.

The tender is carried on rolled steel wheels, and has a straight-top tank, with capacity for 7,000 U.S. gallons of water and 14 tons of fuel. In point of dimensions and hauling capacity, this locomotive is fully the equal of many which are employed in regular freight service on trunk lines.

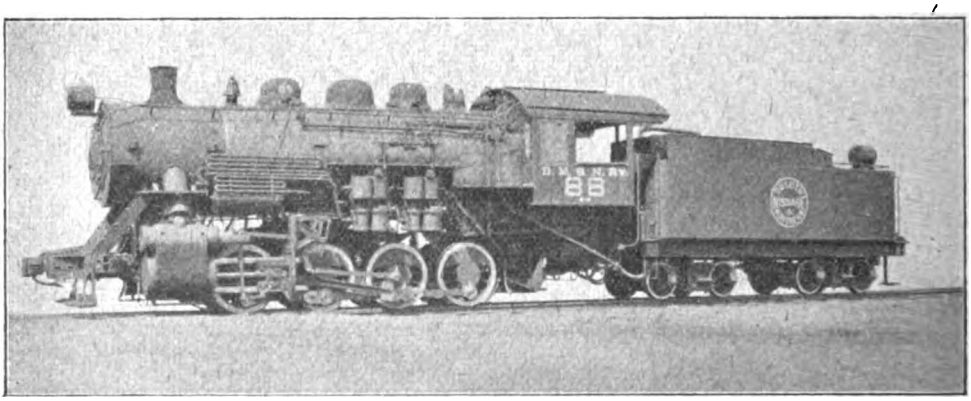
The locomotive for the Lake Terminal Railroad, shown in Fig. 7, is of the same type as the Missabe engine, but is heavier, weighing 225,100 lbs. without tender, and developing a tractive force of 52,000 lbs. The cylinder dimensions are 25 by 30 in.; the coupled wheels are 55 in. in diameter, and the boiler carries a pressure of 180 lbs. per sq. in. The locomotive illustrated is one of three which use saturated steam, but contemporary with them was a fourth engine of generally similar dimensions, using superheated steam. The heating surfaces of the two boilers are as follows :—

	Saturated Steam.	Superheated Steam.
Firebox	186 sq. ft.	186 sq. ft.
Tubes	3,515 ,,	2,679 ,,
Arch tubes	28 ,,	28 ,,
Total	3,729 ,,	2,893 ,,
Superheater	—	657 ,,
Grate area	54 ,,	54 ,,

As may be judged by the above figures, the boilers are of large dimensions. The front end diameter is 78 in., while the inside firebox has a length of 108 in. and a width of 72 in. The tubes are 15 ft. long. The sides, throat and back of the firebox are stayed entirely by flexible bolts, and three rows of flexible stays support the forward end of the crown.

Machinery details include inside admission piston valves 12 in. in diameter, Walschaert's valve motion, and the Ragonnet power reverse mechanism. The locomotive has flanged tires throughout, with sufficient flange clearance to enable it to traverse curves of 300 ft. radius.

The height limit on this engine is 14 ft. 8 in., and some of the fittings had to be specially located in order not to exceed it. The bell is placed on the left-hand side, on the round of the boiler; and for running backward two sand-boxes are provided, and they are placed right and left, also on the round of the boiler. Careful attention has been given to the arrangement of the cab fittings, in order that the engine crew can handle the locomotive with a minimum amount of inconvenience. The tender has a straight-top tank, and carries 7,000 U.S. gallons of water and 12 tons of coal.



(6) EIGHT-COUPLED LOCOMOTIVE: DULUTH, MISSABE AND NORTHERN RAILWAY.

Fig. 8 shows an eight-coupled switching locomotive for the Lehigh Valley Railroad, which is one of fifteen engines built in 1916. These locomotives were designed and constructed in accordance with specifications prepared by the Railroad Company. A limit of 45,000 lbs. per pair of coupled wheels was imposed in this case, and the engine is considerably lighter than those with the same wheel arrangement previously described. The total weight, exclusive of tender, is 173,300 lbs., and the tractive force exerted is 41,160 lbs.

Special interest centres in the boiler of this locomotive which has a firebox of the Jacobs-Shupert type and is equipped for burning small sized anthracite. The Lehigh Valley

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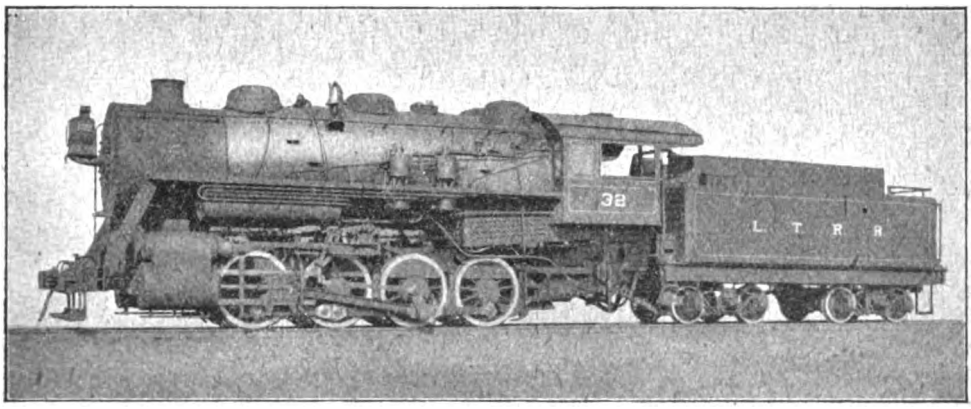


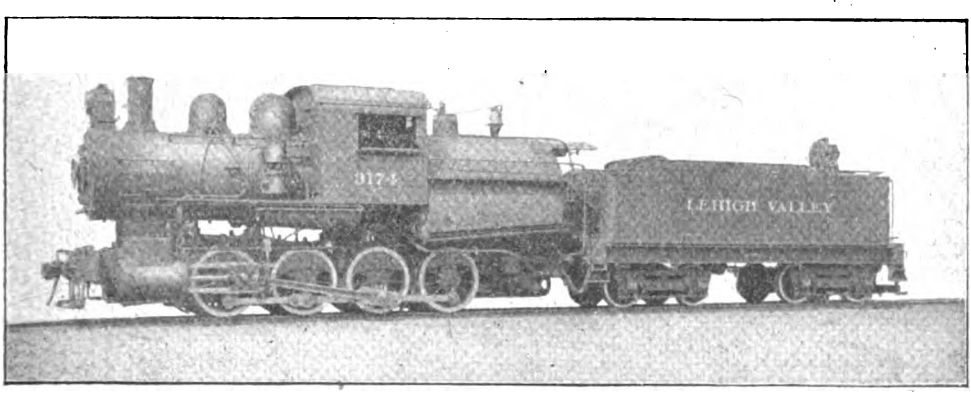
(7) EIGHT-COUPLED LOCOMOTIVE: LAKE TERMINAL RAILROAD.

runs through the anthracite region of Pennsylvania, and large amounts of this fuel are available. The small sizes are necessarily spread in a thin layer and burned on a large grate. In the present instance the grate has a length of 9 ft. 9 in. and a width of 8 ft. 2⅜ in., the area being 79·2 sq. ft. It is composed of rocking bars and water tubes, which alternate with each other and run lengthwise of the firebox. The cab is placed ahead of the firebox over the boiler barrel, while the firing deck is on the tender. Two fire-doors are provided, on account of the unusually wide grate. The total heating surface of the boiler is 2,258 sq. ft., and the pressure carried is 200 lbs. per sq. in.

The firebox is of the sectional type, with inside and outside shells each composed of a series of plates. These are flanged to a channel section and bent to suit the transverse contour of the firebox. These sections are set up adjacent to each other with stay plates between them, and the parts are then riveted together to form a single structure. The stay plates have openings cut in them, to permit the free circulation of steam and water. The throat sheet and back head are stayed by bolts in the usual manner, but the total number thus used is comparatively small; and this fact, together with freedom from liability of serious explosion, are claimed as the chief advantages of the Jacobs-Shupert construction.

Saturated steam is used in this locomotive, and it is distributed by balanced slide valves which are operated by the Stephenson link motion. The principal parts of the motion work are of steel, case hardened, and all the pins are fitted into hardened bushings. Flanged tires are used on all the wheels. The lateral play between rails and flanges is ⅜ in. more on the front and rear wheels than on the two intermediate pairs. This arrangement reduces flange friction when traversing curves.

The tender of this locomotive has capacity



(8) EIGHT-COUPLED LOCOMOTIVE: LEHIGH VALLEY RAILROAD.

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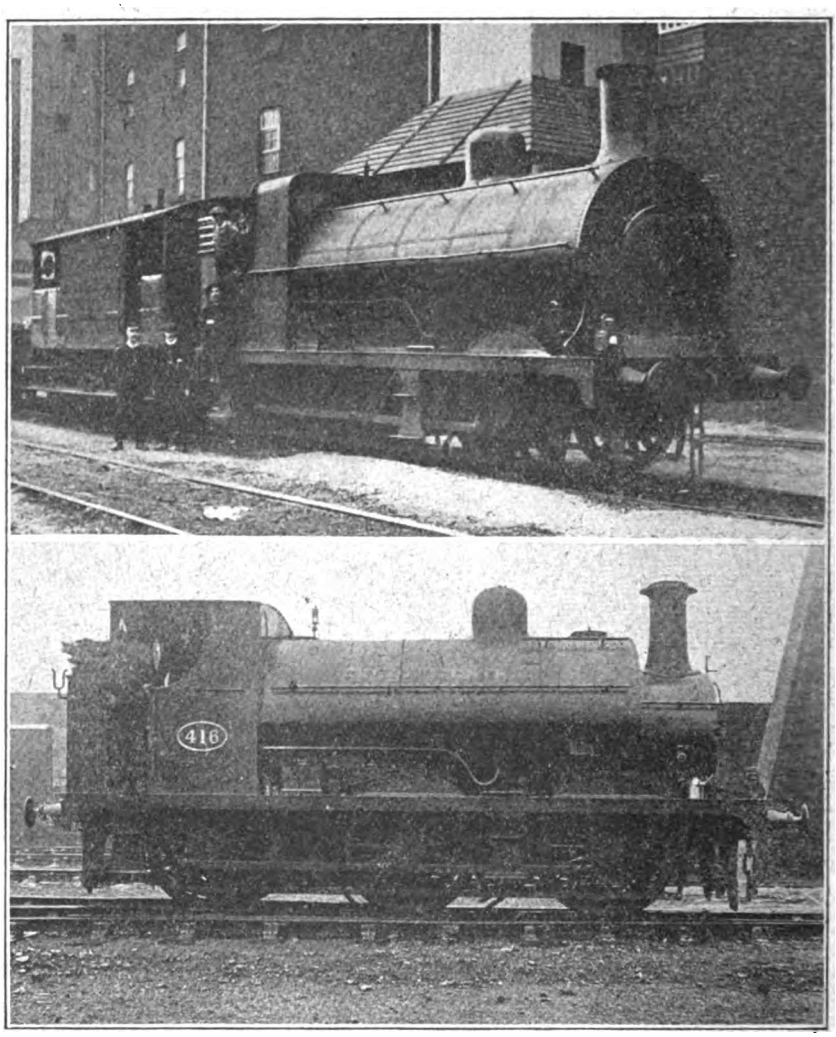
for 6,000 U.S. gallons of water and 10 tons of coal. It is carried on rolled steel wheels, and has a strongly built frame, with 13-in. steel channels for the longitudinal sills. The coal gates are placed farther back from the forward end than usual, in order to provide sufficient room for the firing deck.

The locomotives that have been described serve to illustrate present practice in switching engine construction. In some special cases where the work is unusually heavy, ten-coupled or articulated engines are used; but the six and eight-coupled types are to-day doing by far the greater part of the switching on American railways.

BEFORE AND AFTER RE-BUILDING.



Photo] [*P. F. Cooke.*

GREAT CENTRAL RAILWAY 0-6-0 SADDLE TANK LOCOMOTIVE NO. 416.

The upper photograph was taken at London Road, Manchester, just before the engine was re-built, and the lower one at Heaton Mersey, immediately after.

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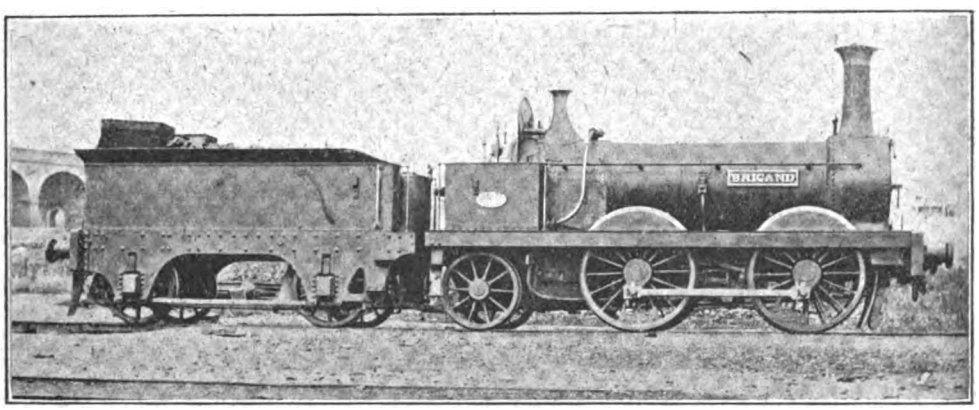
Locomotive and Train Working in the latter part of the 19th Century.

THE LONDON, CHATHAM AND DOVER RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

BEGINNING its existence as a local line connecting Chatham with Canterbury, known as the East Kent Railway, the London, Chatham and Dover was a much younger railway than the South Eastern. The first portion of the East Kent Railway was opened in January, 1858, from Strood to Faversham. The original name underwent a change in August, 1859, prior to its obtaining access towards London in 1860 as far as Penge. The actual terminal extensions into Victoria and Ludgate Hill were not completed until the end of 1864, but the Canterbury–Dover extension of the main line had been in use from 1861. There was also a long branch line from Swanley Junction to Ashford which was made and completed in sections. The section from Swanley to Sevenoaks was opened as early as 1862, but the extension to Maidstone was opened only in 1874, and ten years later in 1884 came the final extension from Maidstone to Ashford. The Sittingbourne and Sheerness line was opened in 1860, and at a later date Queenboro' Pier became a rival to Dover as a point of departure for the Continent.

The "Chatham" line, therefore, commenced with an advantage over the South Eastern not only in having a shorter route to Dover than the older one of the latter company *viâ* Redhill, but it might also be supposed that the rolling stock would have been somewhat more modern. But far from it, and from what nether depths the "Chatham" excavated most of its carriages, goodness only knows! The description, which I gave of the third class carriages on the South Eastern, applies also to those of the "Chatham," perhaps "somewhat more so." At one period both lines were about on an equality in this respect, but the gradual improvement that took place in the main line coaches of the South Eastern was not apparent in those of its rival. The fact is that the South Eastern did show a fair return to its shareholders, but the "Chatham" always seemed to be plunged into the most impecunious depths, and having started operations with a miscellaneous collection of "dog-boxes," duly



0–4–2 MIXED TRAFFIC ENGINE, NO. 1, *Brigand.*
Wheels, 5 ft. Cylinders, 16 in. by 22 in. Built by Sharp, Stewart and Co., 1861.

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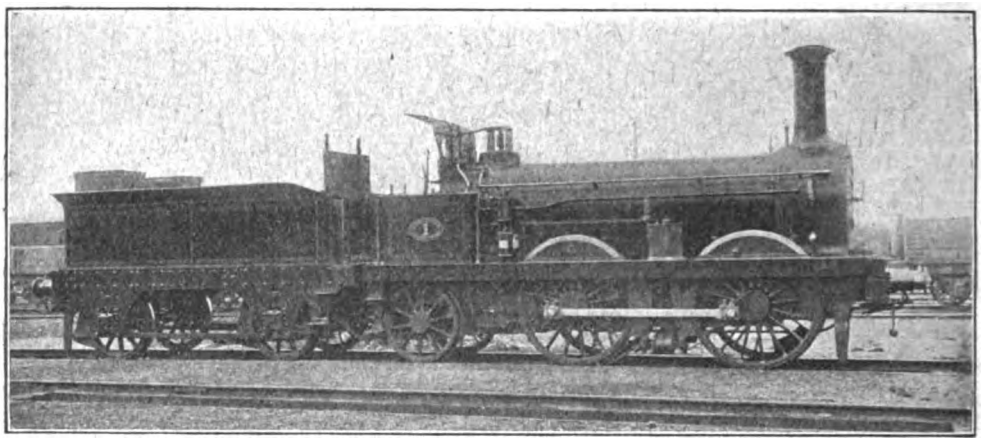

Photo] [*Locomotive Publishing Co., Ltd.*

ENGINE NO. 1, REBUILT AT LONGHEDGE, 1879.
Domeless Boiler.

labelled third class carriages, it adhered faithfully to them because the money was not forthcoming to replace them. In one respect, however, the "Chatham" trains looked better than those of its rival, in that there was much more uniformity in the shapes and sizes of the carriages. This of course applied only to the outsides, the insides defied coherent description, which cannot be attempted in language temperate enough for the pages of this magazine.

The line was generally referred to in the "seventies" as the "Smash 'em and over," but this title was unduly harsh and hardly merited. The speeds over certain sections were certainly higher than those on the South Eastern, for there was no rigid 60 miles per hour maximum restriction, and the old "dog-boxes" had an extremely uncomfortable way of rolling about, especially as the majority of them ran on four wheels. But in the matter of actual accidents the Chatham was usually no worse than any other railway, although there was one very bad smash at Sittingbourne.

On the other side it should be added that the signalling arrangements were a long way ahead of those of other and larger railways, and it is to the lasting credit of the "Chatham" that it was the first railway to instal the Sykes system of electric block signalling. In this the signal at A box was locked at danger until the signalman at the next box B set in action an electric current which released the lock. Moreover, to prevent any mistake from occurring, a treadle was inserted in the line between B and C, and once B had accepted a train from A, he could not release the lock until the train had passed B's box, and worked the treadle on its way to C.

Like those of the South Eastern, the main line Dover expresses of the London, Chatham and Dover were first class or first and second class only, and the rolling stock used on these crack trains was quite up to average comfort, although the backs of the second class compartments were somewhat too vertical, and the compartments themselves very small. The excessive fares were naturally the same as those on the South Eastern.

Of course the two rival lines did not get along comfortably with one another. The South Eastern, as has already been mentioned, had its little differences with its other neighbour the "Brighton" over the joint line to Redhill, but these were as storms in a teacup compared with the eternal feud that existed between the two Dover lines. For they not only competed for the Continental traffic, but also for the seaside traffic to the Kent coast, and they also came into collision at Rochester, Maidstone, Sevenoaks, and Canterbury. Consequently Sir Edward Watkin's views on the subject of the "Chatham," and the rival chairman's opinions anent the South Eastern always succeeded in imparting an exhilarating atmosphere to the half-yearly meetings of the respective shareholders. Those exciting days are now gone, for the two companies in 1898 fell on each other's necks in a most loving embrace, and have since trodden the path of life in a more or less sanctified union tinged with the pious hope of increased

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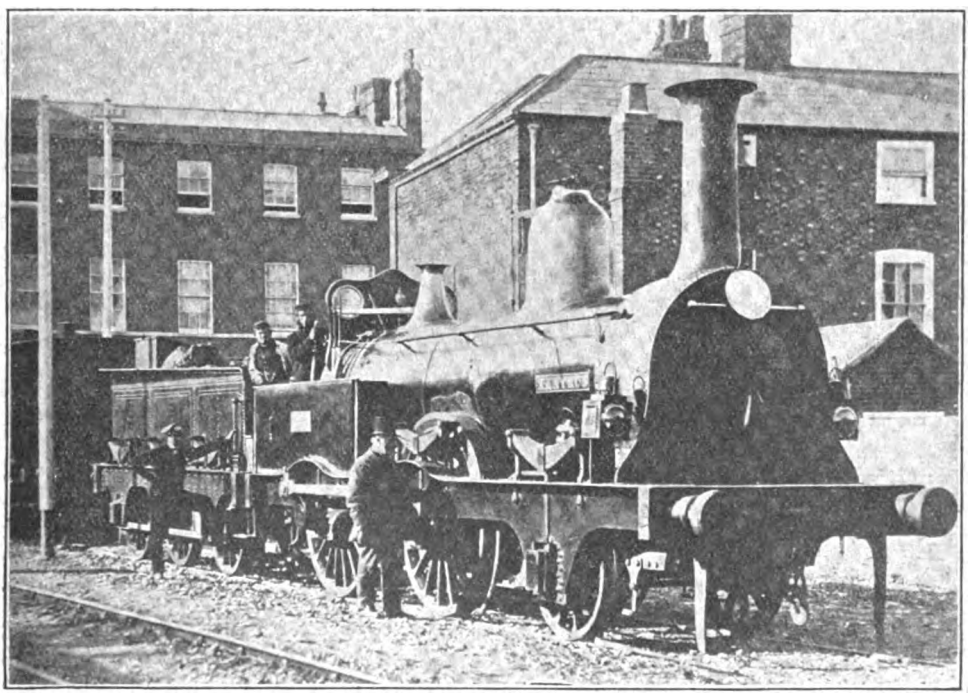
worldly dividends. On the part of the Chatham ordinary shareholders this is not to be wondered at, for their £100 shares usually stood at about £20 with occasional rises, when times were particularly propitious, to 20⅛.

With regard to locomotives the Chatham started its career with a very peculiar assortment, of which many were coupled "Cramptons" of a type that used to be found on some of the French railways. These had outside cylinders and leading bogies. There were also five single express engines also of Crampton's rear driver pattern, similar to the South Eastern "Folkestone" type with dummy crank axles, and these also had bogies. The bogies of all these engines were of a very old fashioned pattern with outside frames and swivelling pins without side-play. After Mr. Martley had become the chief locomotive engineer of the Company, he scrapped most of the bogies and all the Cramptons, and used the boilers in complete renewals of the engines as ordinary 2–4–0 locomotives with inside cylinders and double frames.

Dealing, however, with the engines as they existed during the last twenty-two years (1876 to 1898) of the "Chatham" railway, there were two 0–4–2 "mixed traffic" engines which had been built in 1861 by Sharp, Stewart and Co., and formed part of an order which that firm was then constructing for the Glasgow and South Western Railway to the general designs of Mr. Patrick Stirling. One of these engines is illustrated on page 373, and the Stirling domeless boiler will be noted. They had 5 ft. wheels and 16 in. by 22 in. cylinders, and were named *Brigand* and *Corsair* on the Chatham. These high sounding names had no connection with the operations of the Company in the matter of extracting excessive fares from their patrons, but were derived from Sir Daniel Gooch's first two broad gauge 4–4–0 tank engines on the Great Western, Mr. Martley having previously been one of Gooch's pupils and district superintendents. It may here be observed that Mr. Martley, like Gooch, used names only to distinguish the engines, and that the London, Chatham and Dover engines were numbered only after 1875 when Mr. D. Kirtley succeeded him. The Martley engines retained their names for some years afterwards until they were rebuilt, but had additional numbers painted on the buffer



ENGINE NO. 26, *Xanthus*.

Coupled Wheels, 5 ft. 6 in. Cylinders, 16 in. by 22 in. Renewed at Longhedge, 1863–4.

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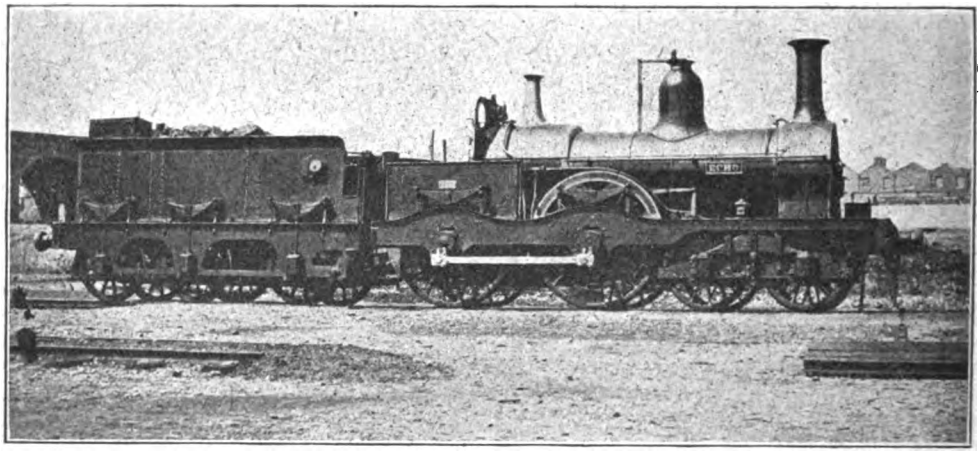

Photo] [*G. F. Burtt.*

OLD 4–4–0 EXPRESS ENGINE, NO. 27, *Echo.*

Wheels, 6 ft. 6 in. Cylinders, 16 in. by 22 in.

These were originally built as 4–2–0 single engines with dummy crank shafts.

beams and also on the backs of the tenders.

Brigand and *Corsair* became Nos. 1 and 2, and for many years were stationed at New Brompton (Chatham) to work local trains in that district. When they were rebuilt by Mr. Kirtley, as shown on page 374 they were again provided with domeless boilers, and the last time I saw No. 1 in 1896 it was still at work in the Chatham district.

The coupled Cramptons were renewed about 1862–1864 as 2–4–0 engines having 5 ft. 6 in. wheels and 16 in. by 22 in. cylinders in the form illustrated by *Xanthus* (page 375). There were 24 of this class, which Mr. Kirtley numbered 3 to 26, and as their names may be of interest to some readers I append them as below :—

3	*Falcon*	15	*Cerberus*
4	*Vulture*	16	*Tiger*
5	*Heron*	17	*Gorgon*
6	*Stork*	18	*Leopard*
7	*Swift*	19	*Jackal*
8	*Dottrel*	20	*Harpy*
9	*Swallow*	21	*Panther*
10	*Ostrich*	22	*Pegasus*
11	*Petrel*	23	*Satyr*
12	*Pelican*	24	*Sphinx*
13	*Lynx*	25	*Siren*
14	*Gorilla*	26	*Xanthus*

Between 1878 and 1883 all were rebuilt with Mr. Kirtley's standard type of boiler and larger cylinders 17 in. by 22 in. They may be described as the slow train engines of the Company and were distributed at various stations such as Longhedge (London), Chatham, Maidstone, and Faversham for this purpose. The majority were gradually withdrawn from service by Mr. Kirtley between 1892 and 1898, except Nos. 9, 10, 11, 18, 21 and 22 which survived to be numbered with the South Eastern and Chatham Railways amalgamated stock and were finally scrapped by Mr. Wainwright.

Five express engines, Nos. 27 *Echo*, 28 *Coquette*, 29 *Flora*, 30 *Flirt* and 31 *Sylph* retained the old bogies on their reconstruction by Mr. Martley. They then became almost the earliest 4–4–0 bogie tender engines with inside cylinders in the country. The coupled wheels were 6 ft. 6 in. diameter and the cylinders 16 in. by 22 in.; and in the late "sixties" and early "seventies" these engines were generally used on the Continental mail expresses between London and Dover. One of them, No. 30, as rebuilt by Mr. Kirtley is illustrated on page 377, the only later alterations consisting of the more modern boilers, cabs, and 17 in. by 22 in. cylinders. In their later years they worked main line slow trains, 28 being stationed at Faversham, and 31 at Dover.

The next class consisted of twelve 2–4–0 express engines with double frames, 6 ft. 6 in. coupled wheels, and 17 in. by 22 in. cylinders, and all of them came from the works of Sharp, Stewart and Co. in 1862–3. These engines were as follows :—

32	*Dawn*	38	*Violet*
33	*Alert*	39	*Crocus*
34	*Herald*	40	*Snowdrop*
35	*Pioneer*	41	*Verbena*
36	*Frolic*	42	*Bluebell*
37	*Vigilant*	43	*Hyacinth*

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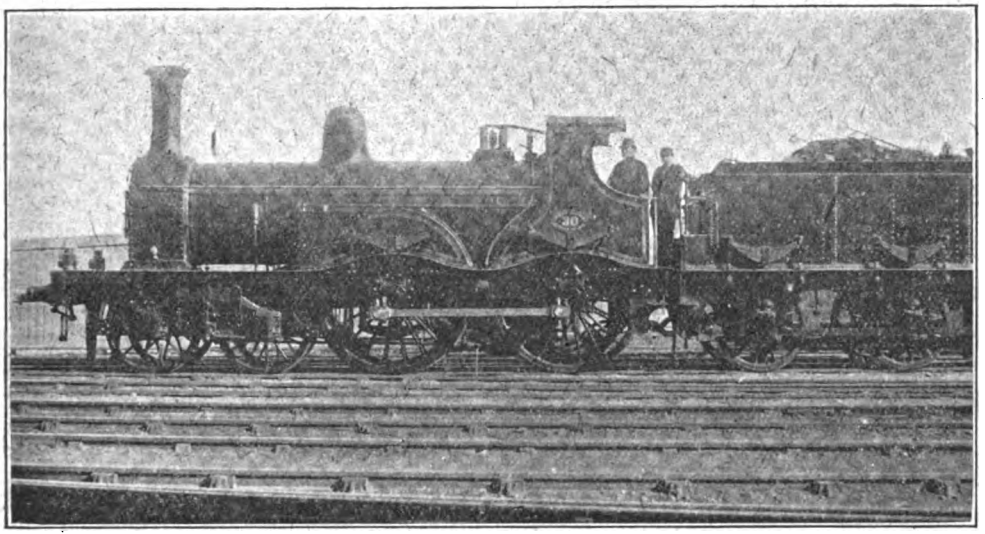


Photo [*Locomotive Publishing Co., Ltd.*

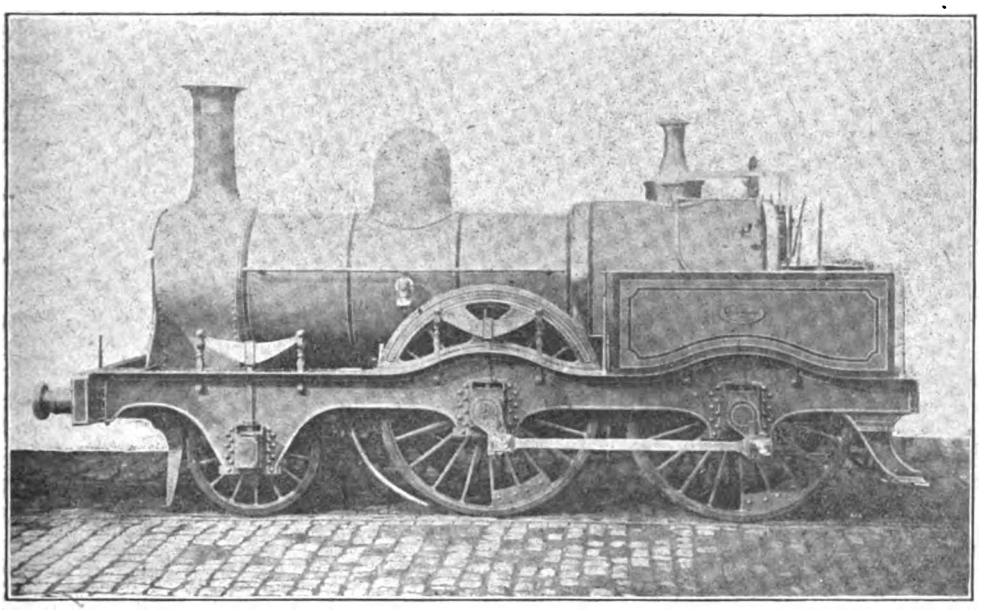
OLD 4–4–0 EXPRESS ENGINE (CLASS 27 TO 31).

Rebuilt at Longhedge, 1886. Cylinders enlarged to 17 in. by 2½ in.

These were very fine engines for the period when they were built, and always did very good work on the line. Although they frequently did duty on the Dover expresses, Nos. 32 to 37 being at one time stationed there, they may perhaps be more aptly described as the Kent Coast express engines, and 38 to 41 were quartered at Margate to run the fast trains to London. All of them were rebuilt by Mr. Kirtley in the form shown by the illustration of No. 41.

There were also six engines of a similar type as follows :—

44	*Reindeer*	47	*Templar*
45	*Elk*	48	*Talisman*
46	*Champion*	49	*Zephyr*



2–4–0 EXPRESS ENGINE (CLASS 32 TO 43).

Coupled Wheels, 6 ft. 6 in. Cylinders, 17 in. by 22 in. Built by Sharp, Stewart and Co., Manchester.

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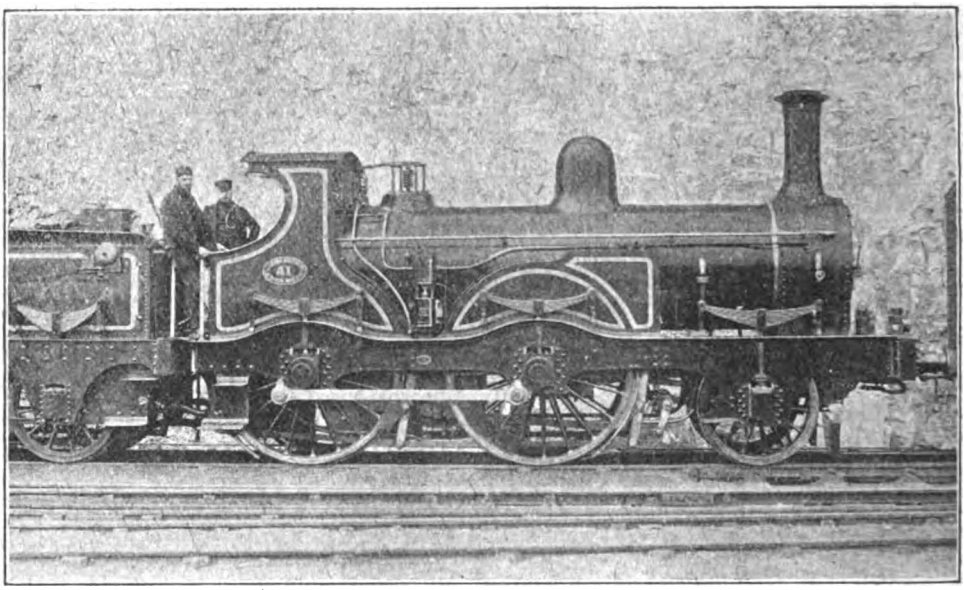

Photo] [*Locomotive Publishing Co., Ltd.*

ENGINE NO. 41 (CLASS 32 TO 43).
As rebuilt at Longhedge by Mr. Kirtley.

These also had 6 ft. 6 in. coupled wheels, but the cylinders were 16 in. by 24 in. They were built in 1865 by Messrs. Peto, Brassey and Betts of the Canada Works, Birkenhead, and had several features in common with Mr. Cudworth's standard South Eastern practice. The sandbox encircled the base of the dome, a position chosen in order to keep the sand dry. Both this class and the twelve preceding engines by Sharp, Stewart and Co. also had Cudworth's patent fireboxes with long sloping grates and midfeather partitions, but all were subsequently modified and altered to the ordinary form of fireboxes with horizontal grates. The domes were of polished brass. Three almost similar engines, No. 50 *Enigma*, 51 *Mermaid* and 52 *Lothair* were subsequently built in 1869–70 by the Company at Longhedge Works, and were the first engines to be constructed by the London, Chatham and Dover Railway at their own works. They were of the same general dimensions as the Canada Works engines, except that *Enigma* had coupled wheels 6 ft. in diameter, and was the only engine with wheels of this size that ever ran on the "Chatham." The name *Enigma* was chosen because Mr. Martley stated that it was an enigma how the engine ever reached completion, the work on it having been stopped so frequently for want of money. In connection with the usual diameter of driving wheels, 6 ft. 6 in. was, with the exception of *Enigma*, the standard size for express engines throughout the whole existence of the London, Chatham and Dover prior to its union with the South Eastern. As mentioned previously the point to point speeds of the Dover expresses over favourable stretches of line were often higher than those on the South Eastern, owing to the absence of the rigid speed restriction of the latter line. Nevertheless the Chatham engines had smaller wheels, the South Eastern having always favoured 7 ft. wheels, both for the old "singles," and also for Mr. J. Stirling's standard express engines. The Chatham is, however, the more severe road in the matter of gradients. Of the 78 miles from Victoria to Dover, nearly 50 are between 1 in 100 and 1 in 132, and only 18 miles are easier than 1 in 200.

(To be continued.)

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Midland Railway Engineering Department.

MR. WILLIAM B. WORTHINGTON, who is retiring from the position of Engineer-in-Chief of the Midland Railway, was educated at Owens' College, Manchester. In 1876 he was appointed Engineer of the Northern Division, of the London and North Western Railway. The following year he joined the staff of the late Mr. William Baker, Chief Engineer of the London and North Western Railway; and between 1878 and 1883 he was Resident Engineer on new works under Mr. Baker and his successor, the late Mr. Francis Stevenson. From 1883 to 1886 Mr. Worthington officiated as District Engineer on the London and North Western Railway under his father, the late Mr. Samuel Barton Worthington, and as Divisional Engineer (on his father's retirement) from 1886 to 1890. During the next seven years Mr. Worthington was Assistant Engineer to the Lancashire and Yorkshire Railway, under the late Mr. William Hunt, as Chief Engineer; becoming Chief Engineer of that railway in 1897, which position he held until 1905, when he became Engineer-in-Chief of the Midland Railway—the appointment he is now relinquishing on account of ill-health. Mr. Worthington is also, we understand, vacating the presidency of the Institution of Civil Engineers. Mr. Worthington has always taken great interest in engineering education, and has been President of the local associations of students of the Institution of Civil Engineers at Manchester and Birmingham.

The Midland Railway board, in accepting Mr. Worthington's resignation, passed a resolution expressing their high appreciation of his valuable services, and Mr. James Briggs, the Assistant Engineer was appointed Engineer-in-Chief. Mr. Briggs joined the service in March, 1872. He was Chief Assistant to the late Mr. Frederick Campion, Southern Divisional Engineer, from 1880 to 1890. In August, 1890, he was made Divisional Engineer of the Southern Division; in October, 1897, was Assistant Engineer for Maintenance; and was appointed Assistant Engineer in July, 1917. He acted temporarily as Chief Maintenance Engineer from December, 1904, to June, 1905, and as Chief Engineer from November, 1915, to April, 1916. He has been a member of the Institution of Civil Engineers since March, 1881, and was previously a student of that institution. It is noteworthy that remaining in the service Mr. Briggs is the only one of the original founders of the First Aid Movement on the Midland Railway, and of the existing Ambulance Committee formed in 1901, of which committee he was Chairman in 1903, 1910, 1916, and, on account of the war, has continued in office for 1917.

MR. WILLIAM B. WORTHINGTON,
Engineer-in-Chief, Midland Railway, 1905-1917.

MR. JAMES BRIGGS,
Appointed Engineer-in-Chief, Midland Railway.

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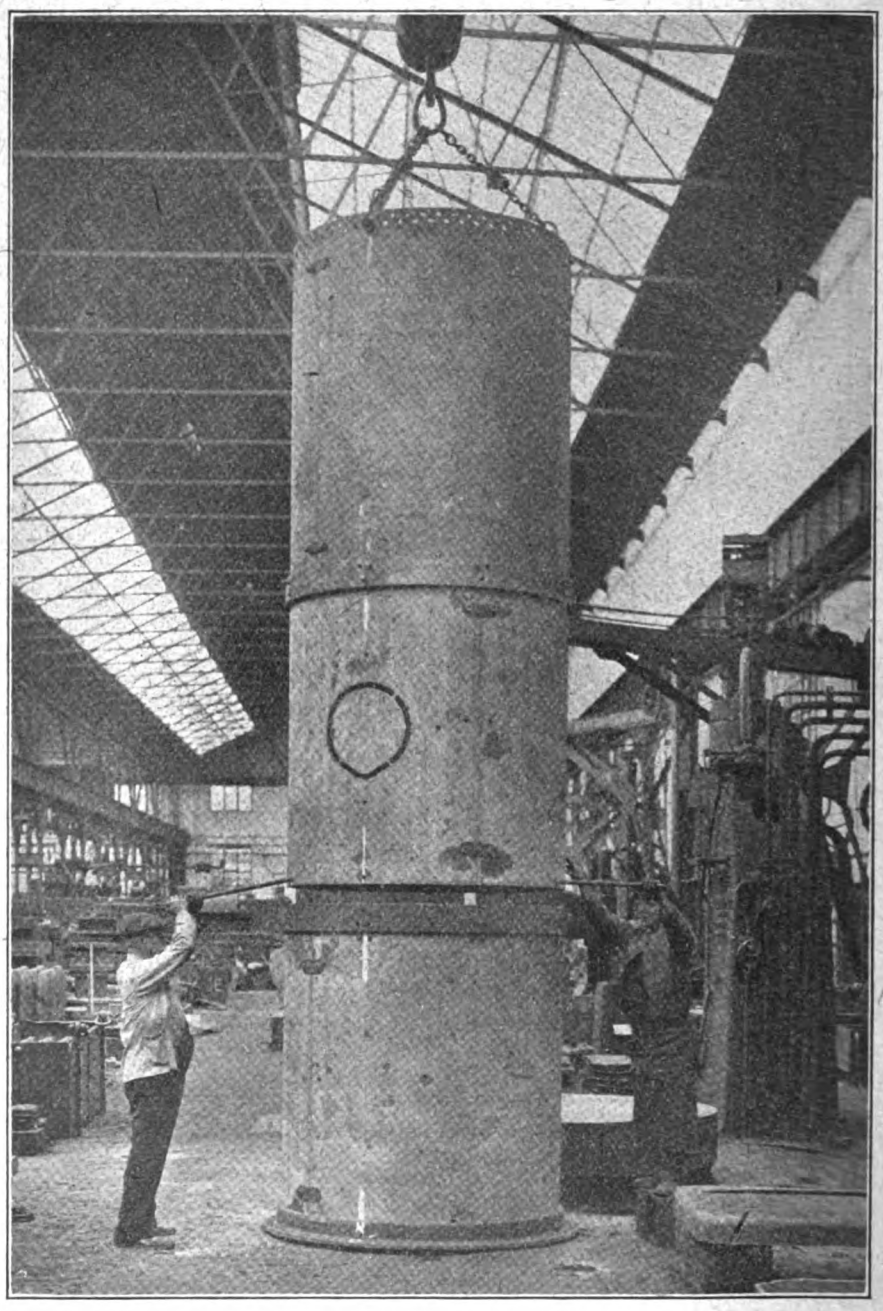

BUILDING UP A LOCOMOTIVE BARREL AT STOOPERDALE.

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The Building of a Locomotive Boiler.

Describing the Construction of the Large Boilers for the "Z" Class "Atlantic" Type Engines of the North Eastern Railway.

By CHAS. S. LAKE, M.Inst.L.E.

IN the course of some recent visits to the locomotive works of the North Eastern Railway at Darlington, the writer was, by the courtesy of Mr. A. C. Stamer, Acting Chief Mechanical Engineer, afforded facilities for following the processes comprised in the building up of locomotive boilers in the large and comparatively new boiler shop at Stooperdale, where also the handsome block of buildings forming the offices of the Chief Mechanical Engineer and his staff are situated. Stooperdale is, roughly speaking, about half a mile distant from the North Road Works of the Company at Darlington and it ranks as one of the largest and best equipped boiler shops at any of the railway works in this country. Special attention was paid on the occasion of the visits to the building up of the "Z" class boiler fitted to the large three-cylinder "Atlantic" type locomotives of that classification. This boiler has leading particulars as follow :—

Diameter outside	5 ft. 6 in.
Length between tube plates	16 ft. 2⅝ in.
Height of centre from rail	8 ft. 11 in.
Firebox, length outside	9 ft.
,, width outside	3 ft. 11 in.
Heating surface, 90 tubes, 2 in. dia.	763·9 sq. ft.
,, ,, 24 ,, 5½ in. ,,	531·9 sq. ft.
,, ,, superheater ..	530·1 sq. ft.
,, ,, firebox	180 sq. ft.
,, ,, total	2,005·9 sq. ft.
Grate area	27 sq. ft.
Working pressure	175 lbs. per sq. in.

The plates from which these boilers are built up are manufactured from acid open hearth steel and the boiler when complete weighs 19 tons 3 cwt. empty.

The boiler plates are delivered on the east side of the shop and about midway the length of the building. The wagons which bring the plates in pass out across the shop after being unloaded by crane power, leaving on the west side. The plates on being removed from the wagons are stacked in the vicinity of the levelling roller. This is arranged in No. 1 bay and consists of four rolls. There are three bending rolls 11½ in. diameter and one for levelling, this latter being 8¾ in. diameter. The plates are first passed through the machine and levelled, or in other words straightened, and after levelling one plate is marked off to form a template for drilling and machining. The plates are drilled in stacks of six, including the template itself, on a duplex drilling machine. They then go to the edge planing machine where the edges are trimmed up to gauge, this applying to barrel and firebox wrapper plates only. The drilling so far done consists of what are known as "tack" holes to permit of the plates being assembled, the rivet holes for the longitudinal and circumferential seams being drilled after the barrel has been shaped. After being drilled and trimmed the plates are separated and the ends are nipped under the press to the required radius. This prepares them for the next operation, which consists of bending or forming the plates into barrel shape. Each plate is passed through the bending rollers as many times as is necessary, the process of forming the barrel being compulsorily a gradual one. The boiler consists of three parallel rings and when these have been shaped they are built up vertically, the longitudinal seams being held together temporarily by a joining plate made from scrap material. The plates are carefully rounded by means of struts across the inside of the barrel, and these ensure accuracy and the retention of the circular formation. Sometimes the plates on leaving the bending rolls are as nearly as possible round, but at other times they are not so correctly shaped as is necessary. The struts referred to consist of round bars 1½ in. diameter cut to the right length, three such struts being used in each plate or ring of the boiler.

In assembling the plates forming the boiler barrel that which comprises the middle ring of the boiler is placed on the floor, and the hydraulic jib crane deposits one of the end rings on the top of it; the position of the joints being correctly marked. The upper plate or ring is then lifted clear to a

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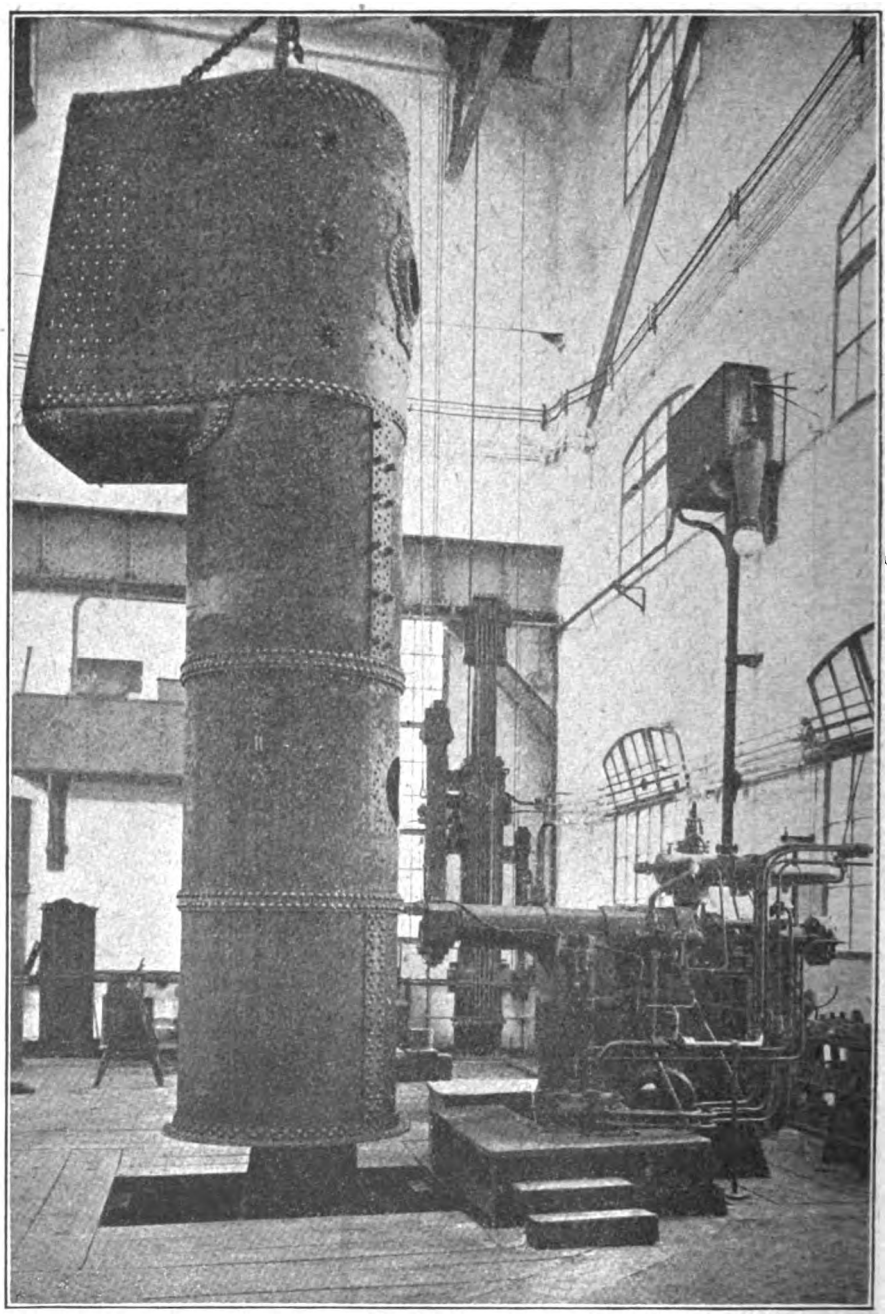

RIVETTING THE BOILER SHELL PLATES BY HYDRAULIC POWER.

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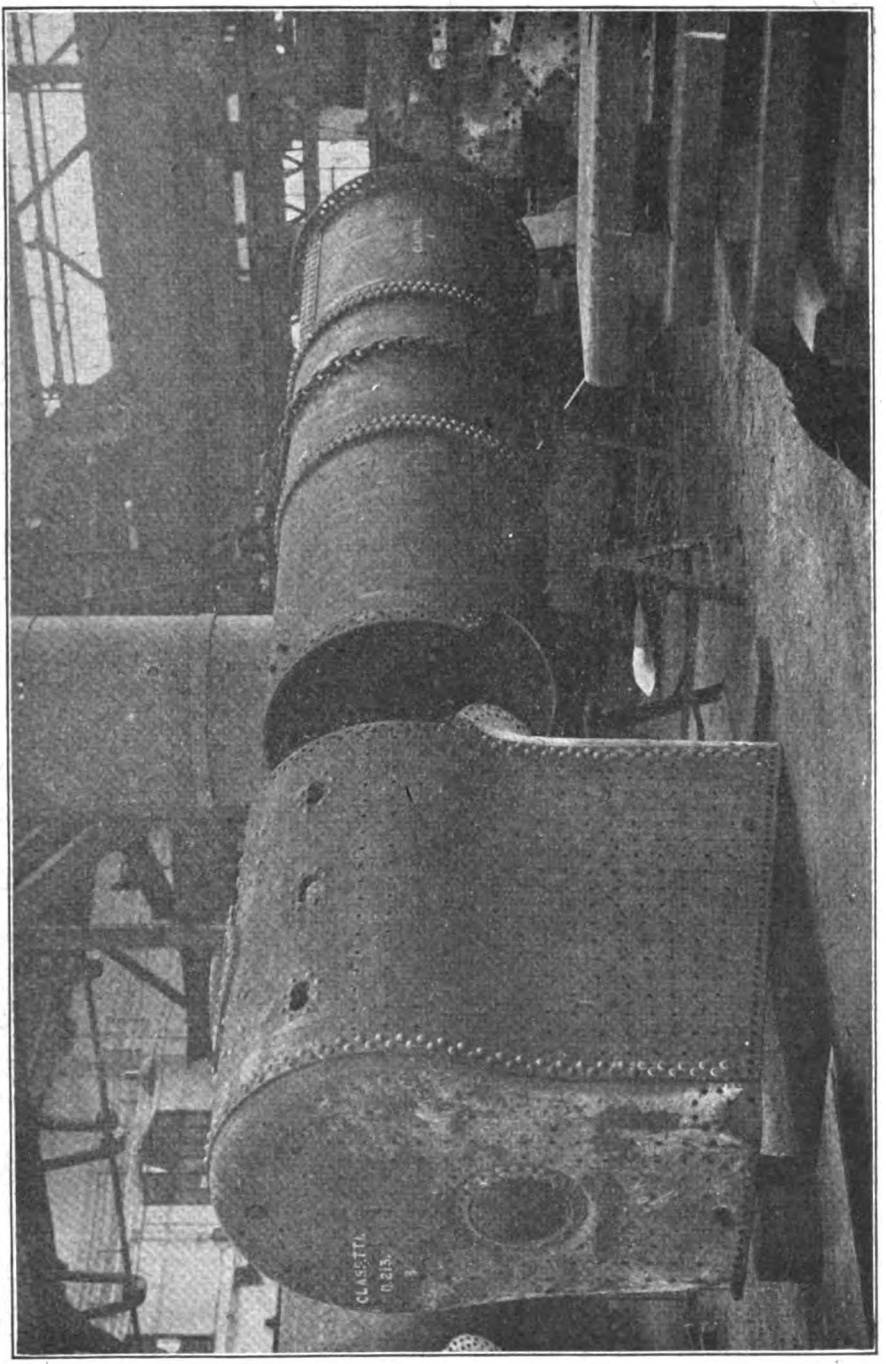

BOILER SHELL AND FIREBOX READY TO BE ASSEMBLED.

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height of about 1 ft. and the joint ring or belt, which has previously been heated in the furnace to a dull red heat, is dropped on to the upper end of the plate resting on the floor. Tacking holes have also been drilled in the joint ring, and when the latter has been lowered on to the boiler plate, steel tapered pins or drifts are pushed in to hold the ring and plate together. Half of the depth of the joint ring encircles the lower plate at this stage, and the other half stands up above it to take the upper plate, which up till now is suspended from the crane. The end plate is now lowered and in its turn is tacked up to the joint ring. The crane next lifts the two assembled plates and the other end plate or ring is placed on the ground, the same operations being repeated. The boiler barrel is now ready for rivetting up and receiving the butt strips or longitudinal seam plates, which have likewise up till now been held in position by tack holes and drift pins. Single rivetting is employed for the circumferential seams and double staggered rivetting for the longitudinal ones. The latter are reinforced on the inside of the boiler by internal strips, these being sufficiently wide to take three staggered rows of rivets.

When the boiler has been roughly assembled the holes for rivetting through the joint rings and butt straps are drilled in position. The boiler is placed in a horizontal position on a special machine, which latter has double heads, each holding two drills. On the cross slide four saddles are mounted in pairs, that is two spindles operate simultaneously on two holes at the required pitch whether on circular or longitudinal seams. The spindle of each pair of saddles are carried on auxiliary slides parallel to each other and at right angles to the cross slide, these slides being so arranged that two holes may be drilled in the circular seams or two in the longitudinal seams, the spindle being in either of the following positions :—

(1) (2)

Mounted on the base plate are two standards or bearings carrying face plates fitted with adjustable jaws for gripping the boiler shell internally. One of these face plates is arranged to be rotated by hand through worm and worm wheels, and by means of plunger and index plate the divisions for circular seams may be accurately obtained. These standards or bearings are adjustable along the base plate by rack and pinion, to accommodate various lengths of shell. A platform is arranged on brackets to bring the operator within reach of the control handles. The main drive is reversible by open and crossed belts on driving pulleys at the end of the cross slide, which are mounted on longitudinal shaft connected by mitre gearing to the spindles. The rivets are $\frac{7}{8}$ in. diameter and the holes are drilled $\frac{1}{32}$ in. larger than this, following general boiler shop practice. When the boiler leaves the drilling machine it is carefully cleaned and the butt straps are taken apart for cleaning purposes also, that is to say, getting rid of grit or drillings, and all holes are slightly countersunk, *i.e.*, to a depth of $\frac{1}{8}$ in. under the snaphead of the rivet. All joints are washed with a weak solution of sal ammoniac to cleanse them. The butt straps are then replaced and bolted securely into position, a bolt being inserted every fourth hole or so. Rivetting up of the joints and straps is next performed on an hydraulic rivetter with 17 ft. 6 in. gap, the boiler being held in a vertical position while this is proceeding, as shown in one of the illustrations. The machine referred to has four pressures, namely, 30 tons, 50 tons, 60 tons and 75 tons, the first being used for rivetting copper plates and the next for general work. Where there are three plates and the heaviest rivetting has to be performed 60 tons pressure is employed. The 75-ton limit is not at present required, and if used for what we may term ordinary work there is a possibility of distortion being set up in the plate due to spreading of the metal under the extreme pressure. The operator working the machine controls also the crane for lifting the boiler in any direction required.

Simultaneously the firebox outer casing or wrapper plate is being prepared. The firebox on the "Z" class boiler has a length of 9 ft. outside, and the plate forming the sides and top measures 21 ft. 9 in. long by 8 ft. 9 in. wide by $\frac{5}{8}$ in. thick. The plate is first levelled and marked off for drilling. It is then placed uppermost on a stack of five plates and the drilling operation follows. After drilling the plates go to the edge planing machine, this being done separately on each plate in order to impart the bevelled edge required for caulking purposes. The plate is then bent to shape in the bending rollers and is mounted on the barrel of the boiler, being temporarily bolted in position with, as before, a bolt to every fourth hole. In the meantime the throat and back plates have been flanged, marked off and prepared generally, this also applying to the foundation ring. A special machine is used for drilling foundation rings in the Stooperdale

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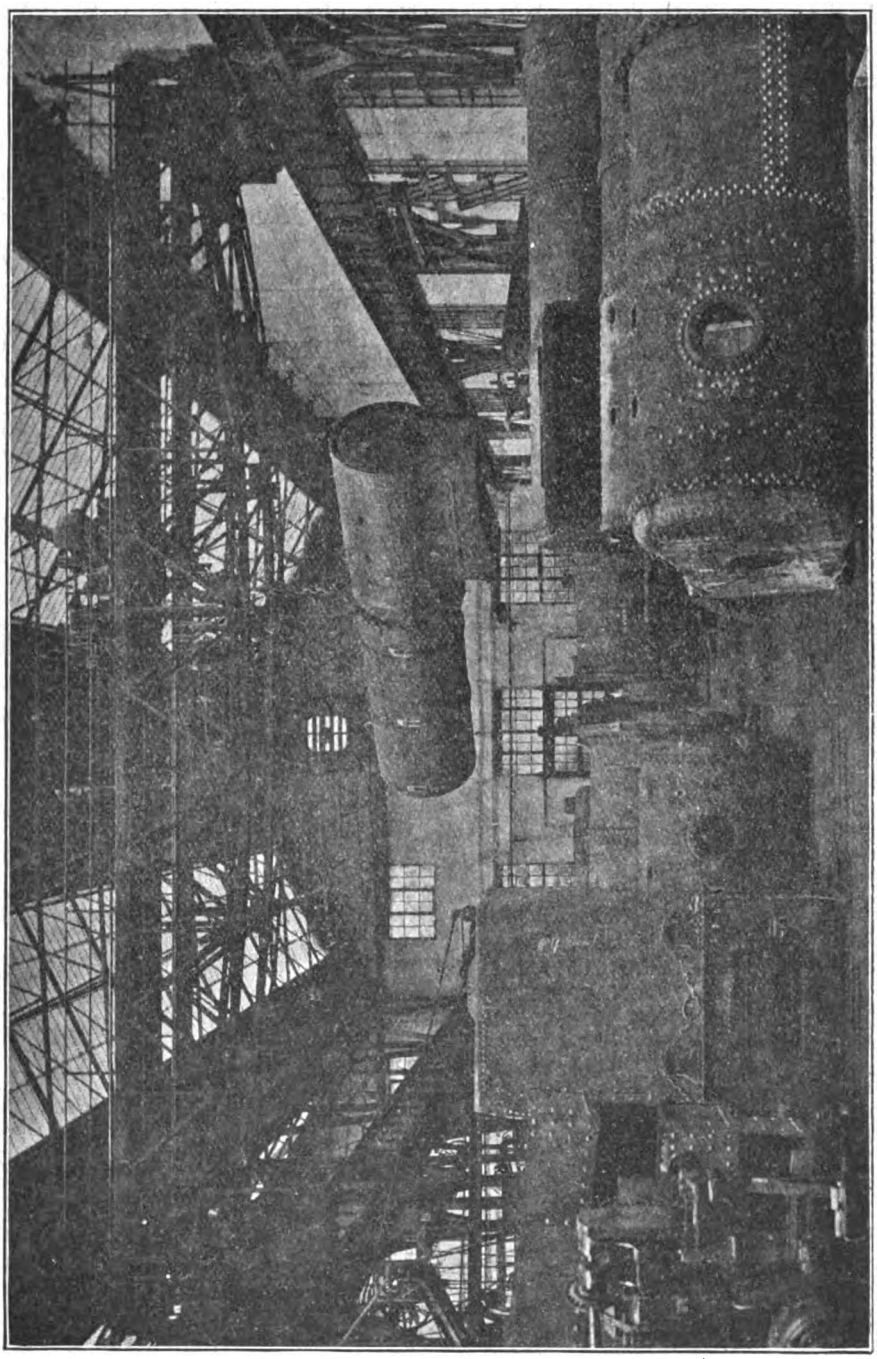

LIFTING A 20-TON BOILER BY A 25-TON OVERHEAD ELECTRIC CRANE.

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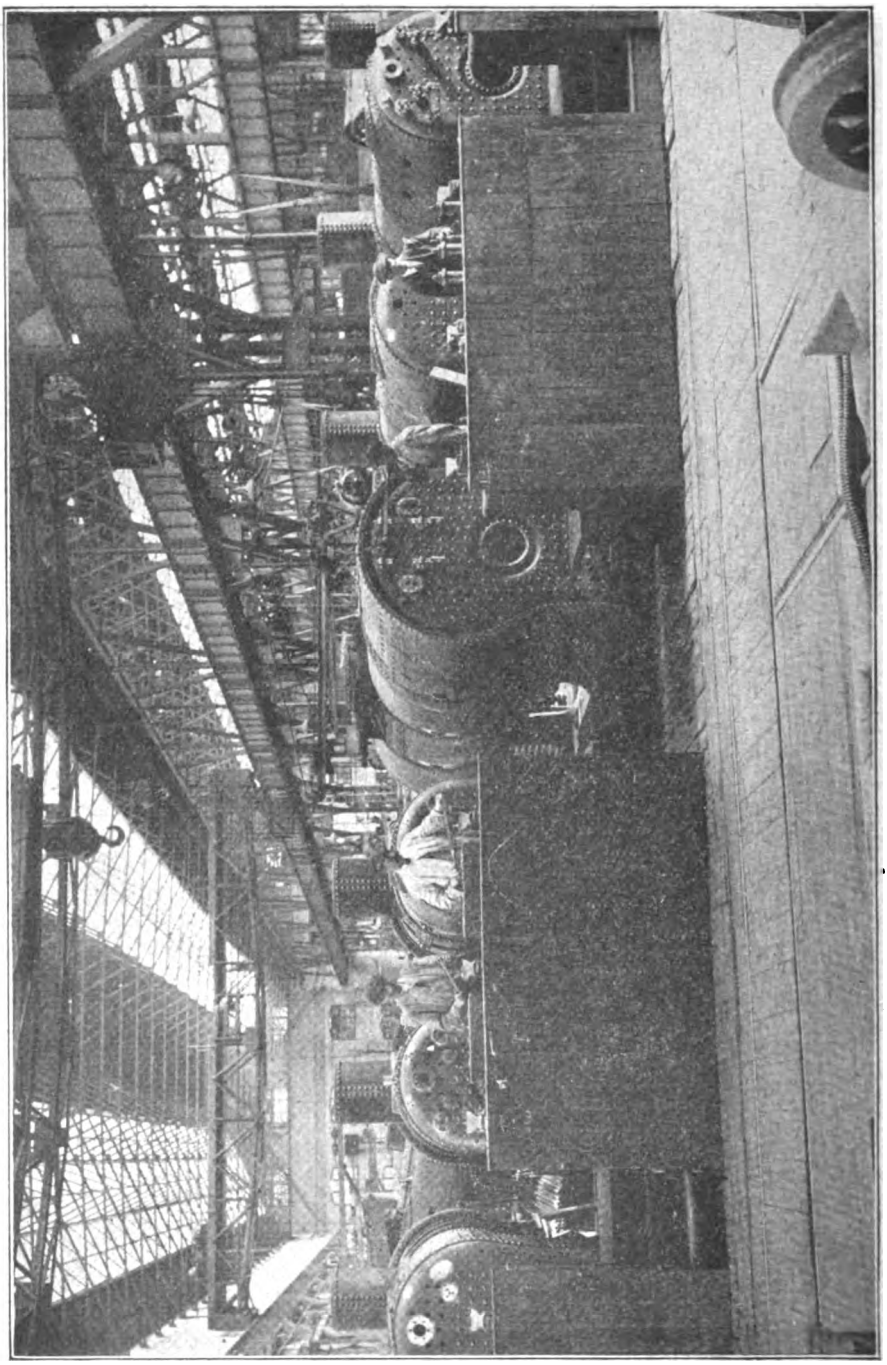

THE BOILER MOUNTING DEPARTMENT.

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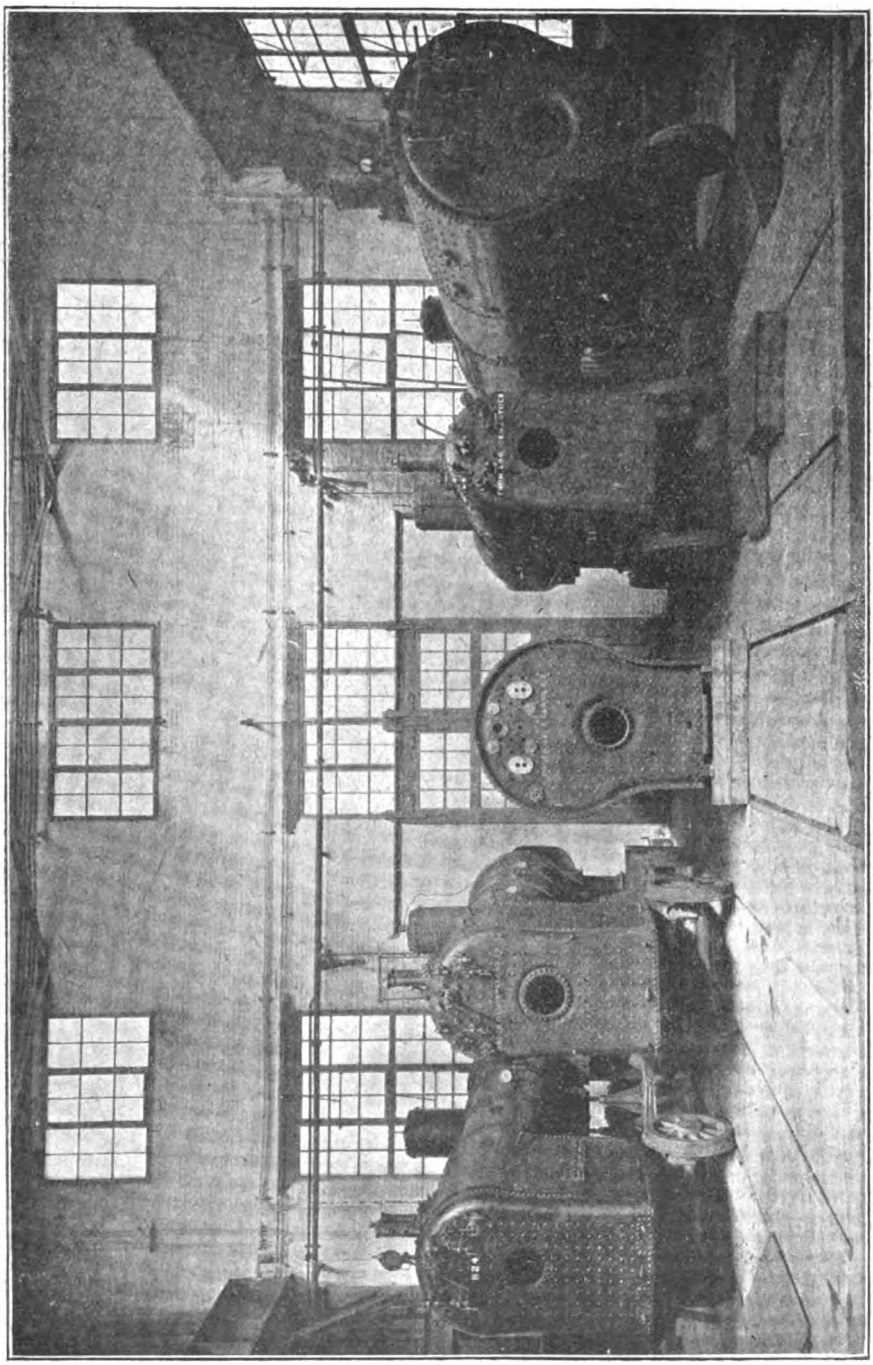

BOILER TESTING PLANT FITTED WITH UNDERGROUND FLUE AND ELECTRIC EXHAUST FAN.

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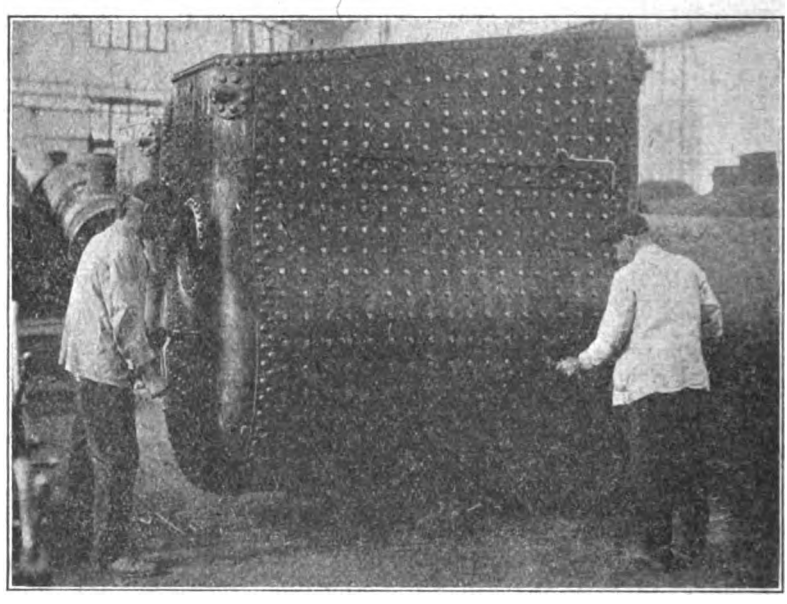
boiler shop, this machine having been converted from a horizontal one with 11 drills to a vertical machine with six drills. The machine has been very greatly improved by this means, and it was certainly a move in the right direction. In its original form the operator could not possibly see what he was doing when drilling 11 holes horizontally, but with the present arrangement he now has absolute control over every movement of the machine. The foundation ring is machined on the outside all round, but on the inside only at the corners, where it fits into the bends of the firebox plate. In the case of a steel firebox the foundation ring is in the case of the boiler barrel plate, after shaping. To overcome distortion of the holes whilst bending the plate after drilling they are drilled $\frac{1}{16}$ in. smaller and afterwards reamered by pneumatic power with the plate *in situ*. The length of the boiler is so great that it cannot all be rivetted at one time, therefore, the barrel is separated from the firebox again and the latter rivetted separately. Then, when rivetted, the joint or connection between the boiler barrel and the firebox is finally made, being machine rivetted round the back joint. The holes for the washout and fusible plugs are tapped by hand.



SCREWING STAYS INTO A FIREBOX.

machined both inside and outside all the way round.

After the wrapper plate or outer firebox shell has been secured to the boiler barrel the throat and back plates are bolted up and then rivetted. Whilst still bolted up care is taken to ensure that the casing of the firebox and the barrel of the boiler are in direct alignment; straight edges and lines or fine cords running from end to end of the boiler to ensure accuracy. This is highly essential owing to the fact that the space limits between the outside of the firebox shell and the main frames of the engine are very small.

All holes for stays and rivets in the outer shell plate are drilled on the flat and not, as

The copper firebox is entered from the back end of the outer shell, the firebox being inverted whilst this is proceeding. The plates of the firebox are dealt with in the same manner as the steel plates as regards drilling, etc., but the flanging of the tube plate of the copper box and the firehole therein is performed by hand. The firehole in the outer shell is flanged in the press, and, as the drawing shows, there is no ring interposed between the copper and steel flanges, these being rivetted up in direct contact with one another. By this means the rivet heads are kept out of the fire space, and also greater economy is secured. There is not so much metal round the firehole to heat. The foundation ring is first attached to the copper

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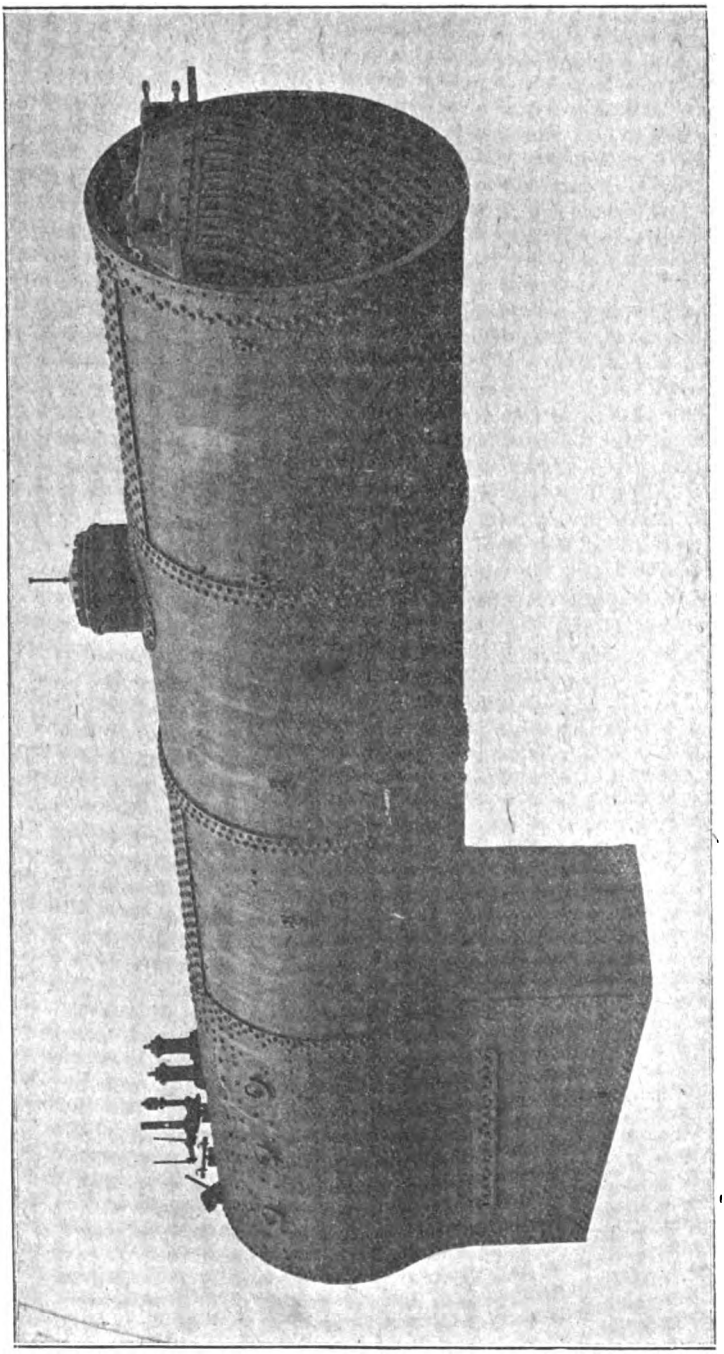

SUPERHEATER BOILER OF "Z" CLASS THREE-CYLINDER "ATLANTIC" TYPE ENGINE OF THE NORTH EASTERN RAILWAY.
Fitted with Superheating apparatus, Lockyer Balanced Regulator Valve and Ross Pop Safety Valves.

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box and both of them placed in the outer shell. The back plate of the firebox is bolted up in position when the copper box has been inserted in order to keep the shape of the outer shell intact against any distortion, the back plate being finally rivetted in position. By doing this before staying the firebox independent movement on the part of the sides and ends is prevented. After reamering the holes in the firebox they are tapped by pneumatic drill—this tool being also used for reamering—and the stays are next screwed in by hand from the outside. To ensure tightness on the part of the stay bolts, every one is tested personally by the foreman of the shop. The copper stays are produced as required on semi-automatic lathes and not turned out in large numbers for stock, thus every stay produced is made, as it were, for a particular firebox and used almost as soon as made. There may be some variation between one tap and another, either through wear and tear or some slight difference in making the tap, and, therefore, the system of producing and using the stays at once obviates any risk from this cause. The roof stays are of the direct pattern, with four rows of flexible expansion stays at the front end. The holes are reamered and the stays are screwed into the copper box and secured by means of nuts underneath, whilst the heads are rivetted over on the outside. The copper firebox stays are rivetted by means of pneumatic hammers inside and out. The special machine used for rivetting the foundation ring also rivets the firehole. This is a portable rivetter working at a pressure of 40 tons.

When the boiler has been assembled it is handed over to the boiler mounters in No. 1 Bay. After the regulator and fittings generally have been mounted in place, including the safety valves, injectors, gauges, etc., the tubes and superheater flues are fitted and the boiler is shortly afterwards ready for testing. This is done, as already explained, at 50 per cent. above boiler pressure for the hydraulic test and 10 lbs. above for the steam test. The superheater header and elements are then added and the boiler is again steamed. The type of regulator used on these locomotives is that designed by the Works Manager at the North Road Works, Darlington, Mr. Norman Lockyer, this being a highly efficient type of valve working on the balanced double beat principle. The smokebox is fitted on when the engine is being erected at the North Road Works.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—
L. & N.W.: Jan., Feb., March, May, 1915.
Great Northern: June, July, 1915.
M.S. & L.: Aug., Sept., Oct., 1915.
Great Western: Nov., Dec., 1915; Jan., Feb., March, April, May, June, July, Aug., 1916.
Glasgow & S.W.: Sept., Oct., 1916.
North Eastern: Nov., Dec., 1916; Jan., Feb., March, April, May, 1917.
South Eastern: June, July, August, 1917.
Lancashire and Yorkshire Railway: Sept., Oct. and Nov., 1917.

In January, 1918, Mr. Ahrons will continue to deal with The London, Chatham and Dover Railway.

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CLAPHAM STATION, MIDLAND RAILWAY.
The Clapham Junction of the North.

Some Curiosities of Railway Station Names.

By H. L. HOPWOOD.

IN studying the pages of Bradshaw, the Handbook of Railway Stations (a publication issued by the Railway Clearing House) or any time-table, one comes across many curious features in connection with the naming of railway stations, junctions and sidings. The following notes do not deal with the matter in its entirety; they are written rather with the idea of stimulating interest in an unusual subject and inducing readers to provide further instances than those mentioned, and so add to the information that follows.

In the early days of railways, stations were not always named after the places they passed *en route*, as many towns bitterly opposed the introduction of the iron road, and the latter often had to make a wide detour in order to avoid a particular town. In these circumstances, the nearest station was generally named "—— Road," being probably five or ten miles away from the town itself, but on the direct road to it. More often than not, stations were named after inns that had been famous in coaching days. An instance of this is found on the Shrewsbury and Hereford Joint Line, at Craven Arms station—now officially known as Craven Arms and Stokesay, the latter being the name of the village that has since grown up round the station. Other stations called after famous hostelries, rather than the actual districts they serve, are Berney Arms in Norfolk, Holland Arms in Anglesey, Portsmouth Arms in Devonshire and the Bat and Ball station at Sevenoaks. More familiar to Londoners are Bricklayers' Arms, Elephant and Castle and Angel, these stations being situated in Bermondsey, Walworth and Islington respectively.

A curious feature is what may be termed the "numerically" named station. Arranged in order, such a list as we have prepared is of considerable length; it is not complete, there being other lesser known examples than those quoted.

Name.	*County.*	*Railway.*
Two Pot House Siding, Mallow	Cork	G.S. & W.
Two Mile Bottom Siding, Thetford	Norfolk	G.E.
Three Bridges	Sussex	L.B. & S.C.
Three Cocks Junction	Brecknock	Cam.
Three Counties	Bedford	G.N.
Four Ashes	Stafford	L. & N.W.
Four Crosses	Montgomery	Cam.
Four Oaks	Warwick	L. & N.W.
Fourstones	Northumberland	N.E.
Five Mile House	Lincoln	G.N.
Fivemiletown	Tyrone	Clogher Valley
Fiveways	Warwick	Midland

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Name.	*County.*	*Railway.*
Six Mile Bottom	Cambridge	G.E.
Six Mile Bridge	Clare	G.S. & W.
Sixmilecross	Tyrone	G.N. (I.)
Seven Kings	Essex	G.E.
Sevenoaks	Kent	S.E. & C.
Seven Sisters	Middlesex	G.E.
Seven Sisters	Glamorgan	Neath & Brecon
Seven Stars	Montgomery	Cam. (W. & L.)
Seven Stones	Cornwall	P.D. & S.W.J.
Nine Elms	Surrey	L. & S.W.
Nine Mile Point	Monmouth	L. & N.W.
Ninewells Junction, Dundee	Forfar	Caledonian
Twenty	Cambridge	M. & G.N. Jt.
Twenty Feet River Siding, Guyhirne	Cambridge	G.N. & G.E. Jt.
Forty Hill	Middlesex	G.E.
Hundred End	Lancaster	L. & Y.

In this list, number one is missing, but from two the numbers run consecutively to seven; eight is blank, but there are three examples of nine, two of twenty and one of forty. From forty we leap to hundred, which provides one example, but we may in passing also refer to the *Hundred* of Manhood and Selsey Tramway. It will be seen that both Two Mile Bottom and Six Mile Bottom are claimed by the Great Eastern Railway; Three Cocks, Four Crosses and Seven Stars by the Cambrian; whilst the London and North Western rejoices in the possession of eight trees, *viz.*, Four Ashes and Four Oaks. As regards the latter, the South Eastern and Chatham goes one better in having Sevenoaks, but the London and South Western beats all arboricultural records in possessing Nine Elms (and also an Ash). There are no fewer than fourteen sisters, honours being equally divided between the Great Eastern and Neath and Brecon Railways. Finally, Ireland contributes an Irishism in the form of a Fivemiletown with a Six Mile Bridge and a Sixmilecross.

Stations with compound names—more often than not very cumbersome—are in evidence on most railways. Here are a few examples taken at random—Bishops Nympton and Molland, Efail-Isaf and Llantwit Fardre, Farningham Road and Sutton at Hone, Rush and Lusk, Sampford Courtenay, Sittingbourne and Melton Regis. In this respect, probably the Great Northern Railway leads the way, as we find New Southgate and Colney Hatch, Potters Bar and South Mymms, Arlesey and Shefford Road, Offord and Buckden, Yaxley and Farcet, and Barnby Moor and Sutton, on the main line, and Carcroft and Adwick-le-Street near Doncaster; whilst in Lincolnshire there are Algarkirk and Sutterton, Blankney and Metheringham, Branston and Heighington, Scopwick and Timberland, etc. Formidable as these are, there are more to come, for if we take a ticket for Pinxton at London Road station, Nottingham, and travel *viâ* Leen Valley Junction, we find the intermediate stations are named as follows:—

Netherfield and Colwick.
Gedling and Carlton.
Daybrook and Arnold.
Basford and Bulwell.
Kimberley and Watnall, for Nuthall and Giltbrook.
Newthorpe and Greasley.
Eastwood and Langley Mill.
Codnor Park and Selston, for Ironville and Jacksdale.
Pye Hill and Somercotes.

The Midland Railway, which also serves a good many of these places, calls one of its stations Langley Mill and Eastwood to distinguish it from the Eastwood and Langley Mill station of the Great Northern Railway.

Lincolnshire, being an agricultural and farming county, apparently likes to have domestic animals associated with the names of its villages, for we there find stations called *Swines*head, *Dog*dyke, and *Cow*bit, whilst Seacroft, near Skegness, was formerly called *Cow* Bank. In the City of Lincoln is the railway junction known as Durham *Ox*.

Very numerous are the cases of railways having stations of similar, or almost similar, names, or names that rhyme very closely with each other. The Great Western Railway has two each of Bampton, Somerton and Staverton. It also has Bontnewydd, Pontnewydd, Upper Pontnewydd and Pontnewynydd. Strangers might be excused for assuming that New Quay Road station was on the road to Newquay; both places are on the Great Western system, but some hundreds of miles apart, New Quay Road being in Carmarthenshire and Newquay in Cornwall.

Then on the London and South Western Railway there is the case of Weybridge and Wadebridge, the almost similar pronunciation of which may very well lead to momentary confusion when a passenger arrives at one station and wishes to book to the other—although we do not imagine the bookings between Weybridge and Wadebridge, or *vice versa*, are very numerous.

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A similar state of affairs might conceivably arise at Hornsey (Great Northern) and Hornsea (North Eastern), between which stations through tickets are issued.

On the South Eastern and Chatham Railway there are Charing and Charing Cross, also Rye and Wye, the latter rhyming very well with each other and also with Eye and Quy, both on the Great Eastern Railway. The well-known Clapham Junction cannot claim a monopoly of the title, as there is also a Clapham (likewise a junction) on the Midland. Willesden Junction (London and North Western) must not be confused with Wilsden (Great Northern) in Yorkshire. Londoners pronounce both names alike, but north country people call the London junction Wil-les-den. On these two railways are also found Colwich and Colwick respectively. Most people have heard of Norwood Junction and Streatham on the London, Brighton and South Coast Railway, but few know that there are also Norwood Junction and Stretham on the Great Eastern Railway.

There is an Ashtown on the Dublin and South Eastern and an Ash Town on the East Kent Railway, a Castle Cary on the Great Western and a Castlecary on the North British, a Stone on the North Stafford and a Stonea on the Great Eastern, a Thorner on the North Eastern and a Thorney on the Midland and Great Northern Joint Railway. Ballywilliam is on the Great Southern and Western and Ballywillan on the Midland Great Western. Other similar examples are Ashbury and Ashburys, Emsworth and Hemsworth, Enfield and Henfield, Roydon, Royton and Royston and Ryde and Wryde. When we *write* of *Speke* (London and North Western) we are reminded of *Speech* House Road (Severn and Wye). As on a railway journey we alternately travel uphill and downhill, it is only natural we shou'd find Uphill and Downhill stations. They are rather far apart, however, Uphill being in Somerset on the Great Western and Downhill in Derry on the Northern Counties line. Watton (Great Eastern, and also Brecon and Merthyr), Wotton (Great Central) and Waddon (London, Brighton and South Coast) are all much alike in sound, and in future matters will be more complicated as the Great Northern will open another Watton station on their new Cuffley to Stevenage line. But perhaps the greatest curiosity of all is found on the North Eastern Railway, where there are a Burton Constable and a Constable Burton. Both stations are in Yorkshire, the former on the Hull and Hornsea line and the latter between Northallerton and Hawes. How many of those readers who make a hobby of collecting railway tickets possess tickets issued between these stations?

The question as to which station name occurs most frequently may be answered by saying that there are at least fifteen Suttons, ten Newports and nine Waltons. Of course, there are variations in the titles, such as Sutton and Sutton Scotney, East Newport and Newport Pagnell, etc. Less common names occurring more than once are Bramley, Overton, Thornton and Waterfall (three times each) and also the following, which appear twice:—

Ashwell	Hythe
Barnham	Kimberley
Barry	Knock
Beeston	Moira
Burnt Mill	Oakley
Crumlin	Pant
Eastwood	Park
Elton	Royston
Enfield	Stow
Fleet	Wellington
Halstead	Wells
Holt	Etc., etc.

It should be understood that these are not the stations of two or more railways in the same town, but are different towns, often widely separated from each other. For instance, the South Wales town of Barry has its namesake in the Forfarshire Barry on the Dundee and Arbroath Joint Line.

The Great Eastern Railway is notable for the circumstance that no fewer than fifty-seven of its station names terminate with the syllable "-ham," whilst the Midland and Great Northern Joint Railway, which traverses much of the district served by the Great Eastern Railway, contributes a further eleven "hams" to the feast.

Stations peculiarly named are many in number. The North Eastern Railway leads off well with examples such as Byker, Low Row, Swine and Tow Law, whilst the Lancashire and Yorkshire takes second place with Mumps and Triangle. The London and North Western provides Crank and Rookery; the Great Western, Bugle, Blue Anchor and Shepherds; the Great Northern, Aby, Idle and Salt; and the North Stafford has Mow Cop and Talk o' th' Hill to its credit. Last, but not least, comes the Great Northern and London and North Western Joint Line with John o' Gaunt.

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There are two stations called Pant, one on the Cambrian in Shropshire and the other on the Brecon and Merthyr in Glamorganshire. Mention of the latter county reminds us that Wales is the real home of stations with unpronounceable names. Fine specimens of these are Dduallt, Gwyddelwern, Llwyngwril, Llanrhairadr Mochnant, Pwllheli, Tylwch and Ystrad Mynach. Probably the shortest and longest single names seen on a Welsh station nameboard are Cwm and Penrhyndeudraeth respectively. We leave readers to pronounce these names as best they can, and whilst they are doing so, we turn from Wales to Ireland, where, on the Great Southern and Western Railway—the longest Irish line—the largest selection of curious names is found, including Ballysodare, Bansha, Dooks, Fota, Horse and Jockey, Kilmacow, Kilmacthomas and Oola; whilst Kesh, Knock, Nobber, Pluck and Ringaskiddy are distributed among other Irish lines. In this respect, Scottish railways are also well represented. On the North British Railway there are Gogar and Crook of Devon, the name of the latter suggesting that the station would feel more at home further south—on the Great Western Railway for example. The undoubted Scottish origin of the Caledonian Railway is indicated by the name of Highlandman station. Among other stations on the same railway are Shotts, Steps Road, Stobo and Quarter. Nigg is on the Highland Railway and Rigg on the Glasgow and South Western Railway, the latter also having Heads of Ayr, Maidens, Racks, Skares and Thirdpart Junction (Ayr). A very rare instance of the letter "w" appearing twice running is seen in the name of Howwood station, also on the Glasgow and South Western Railway. Cults, Culter, King Edward, Knock, Oyne and Udny are found on the Great North of Scotland Railway and Gatehouse of Fleet on the Portpatrick and Wigtownshire Joint Railway.

OLD TRAFFORD STATION, LANCASHIRE.
To the Londoner, "White City" suggests Shepherd's Bush.

Examples such as those given can be quoted almost *ad infinitum*, but here we must take leave of the subject, expressing the hope that readers will exercise their ingenuity and send the Editor some further selections. Space does not allow us to deal with signal box names—among which there are many curiosities—but we suggest to interested readers that here is a fine field of investigation.

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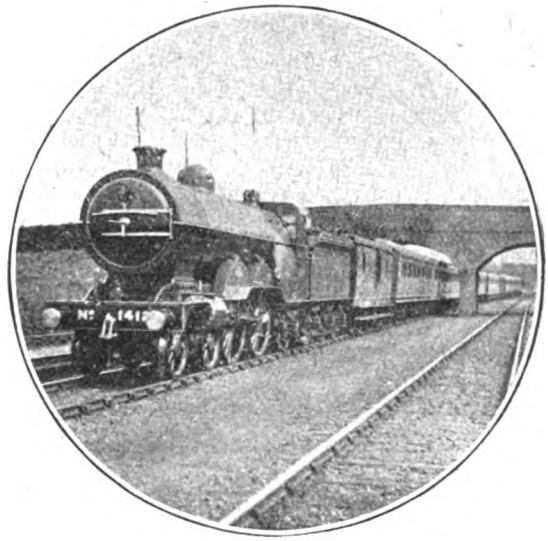
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*R. Hall.*

GREAT NORTHERN RAILWAY.

1.45 p.m. down train from King's Cross.
"Atlantic" locomotive, No. 1412.

IN the last two articles of this series I have been discussing the relative merits of compound and simple locomotives, and more particularly in regard to their respective performances on the road. As illustrating the most advanced development of modern compound locomotive propulsion I have detailed certain examples of the work of 4–4–2 and 4–6–2 engines on the Nord and Paris, Lyons and Mediterranean Railways of France, comparing them as far as has been possible with some of my best records over here. In these comparisons the work of the compound engines has certainly equalled, and in some respects beaten, the best that we can show in this country, especially in the matter of hill-climbing. But now, in order to complete our survey, it is necessary to devote some time to the economic side of the question—an aspect which, in these and kindred discussions, is all too often overlooked or, in the mind of the railway enthusiast, pales its ineffectual fires before the more spectacular glories of performance.

The correspondent whose letter initiated this discussion remarked in this connection "I see that at various times the late Mr. Rous-Marten expressed himself in favour of compounding—at any rate as against multi-cylinder simple expansion. Your view, if I recollect aright, is that compounding gives little or no improvement except where coal is indifferent or expensive or both, and that the improvement is mainly on the economic side." I have therefore been interested in looking up exactly what I did say on the matter. In an article written early in 1912 I find this: "There is a good deal of truth in the argument which was recently put forward by a contemporary that compounding in a British locomotive might still produce a poor return on invested capital, even if saving five per cent. of coal, whereas the compounding of a foreign locomotive on a line where coal costs 25s. a ton might, and often indeed does, show a handsome return on the initial outlay. This statement implies that cheapness of coal in England has to a certain extent impeded the general development of the locomotive engine. It is impossible to dogmatise on such a subject; but the fact remains that compounding has been given an extensive trial in Great Britain, with the result that only one or two lines have achieved with it what might be termed a substantial success. At the same time it cannot be denied that the inherent defects of some of the systems tested have largely prevented the compound principle from securing general adoption in this country." To these remarks I still adhere.

Let us again run briefly over the systems in question. First and foremost we have the arrangement associated with the name of the late Mr. F. W. Webb, who, as Chief Mechanical Engineer of the London and North Western Railway, built 180 compound express locomotives between the years 1882 and 1903. It is a sufficient commentary on

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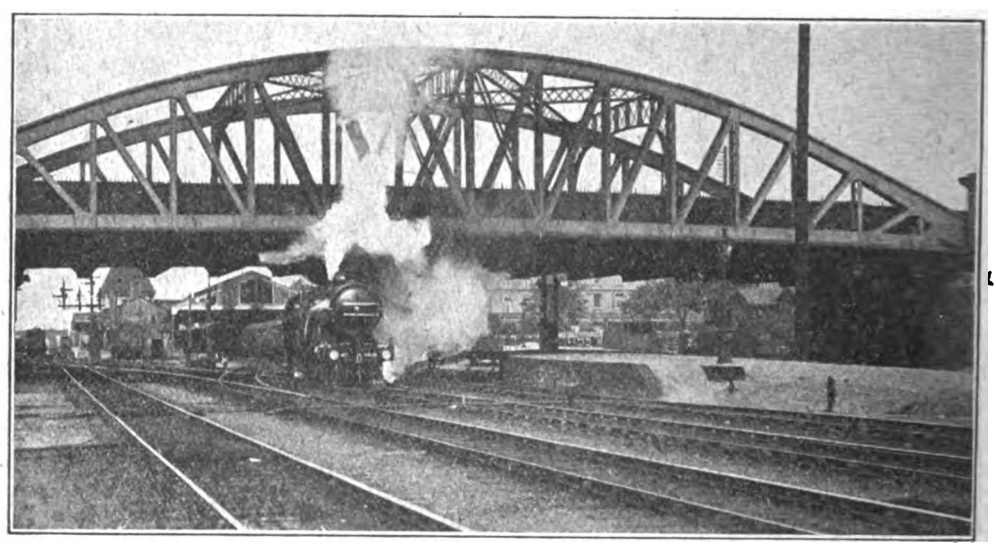
the failure of the Webb system of compounding that at the close of his *régime* at Crewe no express locomotive was allowed to take a train exceeding " =17 " coaches, or about 300 tons maximum load, without pilot assistance, even over the magnificent grading of the London and North Western Railway main line. Wherein lay this undoubted failure? The earliest 80 engines had the 2–2–2–0 wheel arrangement and the next 20 were of the 2–2–2–2 type, the outside high pressure cylinders operating the rear driving axle in each case, and exhausting into one large low pressure cylinder between the frames, which drove the leading pair of driving wheels. But these two axles were not coupled, and, in the opinion of Mr. Rous-Marten and other authorities, this was a fatal defect. It was possible for one pair of driving wheels to slip without the other, so that synchronism between the movements of high and low pressure slide-valves and pistons was left entirely to chance. As a consequence, the engines were generally sluggish in starting and hill-climbing, and always more or less uncertain in general running.

The subsequent 80 engines had the 4–4–0 wheel arrangement, but, although the defect of non-synchronisation was remedied by the coupling of the wheels, and the driving of all four cylinders on one axle, these engines suffered from additional defects of their own. They were hampered considerably by the fact of having no independent cut-off for high and low pressure cylinders. This defect has been got over in the case of a number of the engines by the provision of additional sets of valve-gear for the outside cylinders, but another and a worse defect remains in the proportion of the high pressure to the low pressure cylinder volumes, which is extraordinarily large. With 15 in. by 24 in. H.P. and 20 in. by 24 in. L.P. cylinders, as in the earlier " Jubilee " class engines, this proportion is about 56 to 100, whereas in the " Alfred the Great " type locomotives, with 16 in. H.P. cylinders, the figure is increased to 64 to 100. As pointed out by an American friend, who first brought this fact to my notice, the H.P. cylinders are probably too large to be supplied with sufficient steam for compound working from a boiler of such limited size and steam-producing capacity, whereas the limited ratio of L.P. to H.P. cylinder volume results in increased back pressure in the latter, so that the efficiency of the engine is limited in two distinct ways. In the 3-cylinder engines the ratio of cylinder volume was more normal, being about 44 H.P. to 100 L.P., but the question of limited steam supply, in addition to that of non-synchronisation of piston movements



Photo] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.

Up Scotch express leaving Peterborough.
4–4–2 superheater locomotive, No. 1418.

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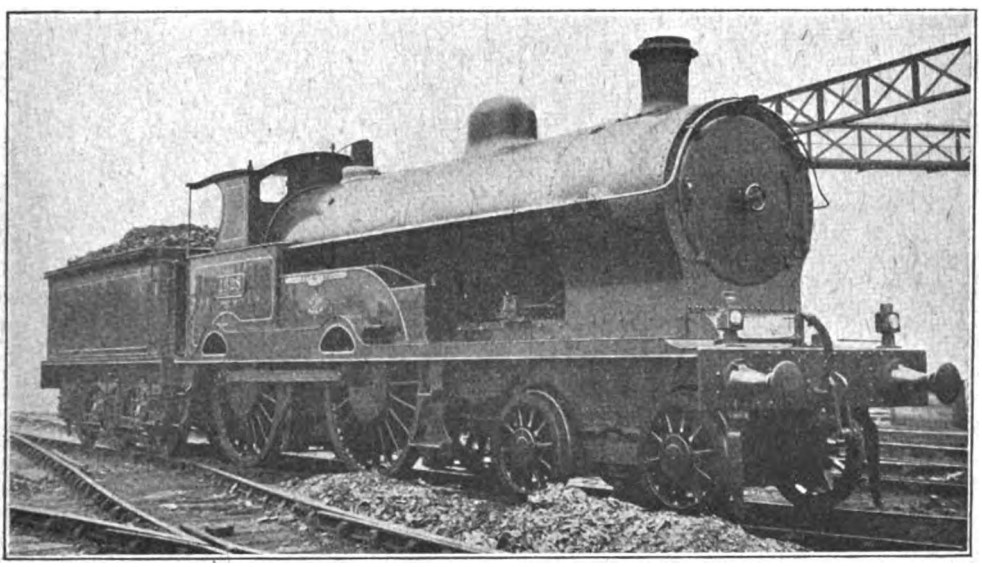
already dealt with, much impaired their work.

Of all the Webb 3-cylinder compounds only the ten 2–2–2–0 "Teutonics" could be said to have achieved any real success, the earlier "Dreadnoughts" of the same wheel arrangement and the 2–2–2–2 "Greater Britains" being occasionally good but generally uncertain, while the 2–2–2–2 "John Hicks"—the last 3-cylinder engines built — were unmitigated failures. My American friend attributes the comparative success of the "Teutonics" to three features which were not actually combined in any of the other engines, *i.e.*, 44 to 100 H.P. to L.P. cylinder ratio, 7 ft. 1 in. driving wheels, of the same kind on the Great Eastern Railway. In the Worsdell-von Borries arrangement two cylinders only are compounded, both between the frames—one H.P. and one L.P.—but the inherent defect of this system is that it is impossible to equalise the working stresses with two cylinders of unequal dimensions, working at different and constantly varying pressure ratios. This is a serious drawback to an express locomotive operating fast and heavy train services, and in itself explains why the system has never been perpetuated, either abroad or over here, except on the Northern Counties Committee section of the Midland lines, where a few Worsdell-von Borries



Photo] [*P. F. Cooke.*

LONDON AND NORTH WESTERN RAILWAY.

4–4–0 superheater locomotive, No. 1628, *Foxhound*, "George the Fifth" class.

resulting in slow piston speed, and loose eccentric motion for the L.P. cylinder, always giving steam to the latter throughout the stroke, and reducing the back pressure in the H.P. cylinders. The 4–4–0 compounds did moderately well, although seldom brilliantly, and were, of course, completely outclassed when the "Precursors" appeared in 1904.

The Worsdell-von Borries system of compounding had some vogue on the North Eastern Railway, under Mr. William Worsdell, who turned out 27 4–4–0 and 20 4–2–2 compound express engines, in addition to several goods engines, after having previously experimented with 11 4–4–0 locomotives compound passenger engines continue to run. But the running conditions of that system are not very exacting.

The most successful compound arrangement which has had prolonged trial in this country is, of course, the Smith system, which has been applied to 45 4–4–0 express engines on the Midland Railway, with modifications patented by Mr. R. M. Deeley, to four "Atlantic" engines on the Great Central Railway, and to one 4–4–0 and two 4–4–2 engines on the North Eastern Railway. All the foregoing engines except the two last-mentioned have one H.P. cylinder between the frames exhausting into two outside L.P. cylinders. The North Eastern

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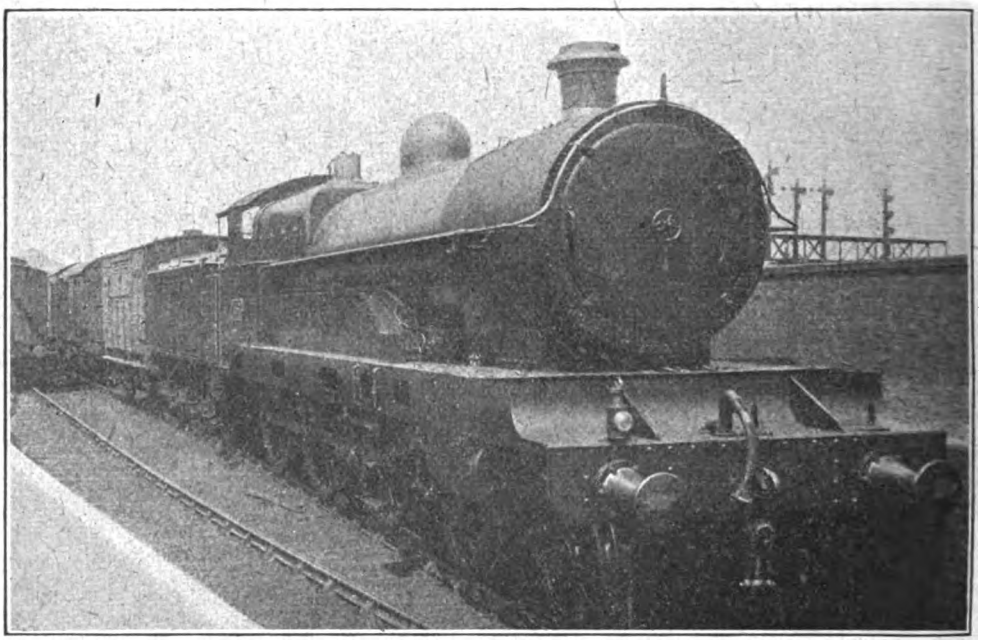
"Atlantics" have two H.P. cylinders inside, and two L.P. outside the frames. Smith compounds are generally arranged with special starting and intercepting valves, or combined valves, under the driver's control, so that live steam may be admitted into the L.P. cylinders as desired. In the Deeley compounds this intercepting arrangement is replaced by a regulator of ingenious design, which when fully open admits live steam to the L.P. cylinders only, but as the regulator handle is moved back across the quadrant plate causes the working to change through a semi-compound stage to full compound working. Thus the engines at the moment of starting work as powerful 2-cylinder simple locomotives. On the Midland Railway the work of these compounds has always been notable for its excellence, and the same remark applies to the limited number of Smith compounds on the Great Central Railway and North Eastern Railway, which do first-class work and are great favourites with their drivers.

The three 4-cylinder compound "Atlantics" of the Great Northern Railway and the three de Glehn compounds of the Great Western Railway are now the only ones which have not yet been mentioned. As regards the former three, their cylinders are very small, in conformity with Doncaster practice, and they have never done very brilliant work, although capable of hauling some heavy loads. But Mr. Rous-Marten wrote of the latter engines that, on the 1 in 40 of Hemerdon bank out of Plymouth, in his experience they improved on the performance not only of all the 4-coupled, but of the 6-coupled engines as well. Further, he noted the then unparalleled speed on a level track of no less than 83 m.p.h. behind No. 102, *La France*, as showing the adaptability of these engines to all classes of road. The work of the corresponding locomotives on the Northern Railway of France has already been alluded to, and is famous the world over.



Photo] [*W. H. Whitworth.*

LONDON AND NORTH WESTERN RAILWAY.

4-cylinder 4–6–0 "Claughton" class superheater locomotive, No. 186 (un-named).

In summing up the advantages of a well-designed compound locomotive for express passenger service I may perhaps be allowed to quote again from my articles of 1912 already referred to. They are these: "First, the possession of a tractive power on starting considerably greater than that of the 2-cylinder engine of corresponding dimensions —assuming, of course, an ample steam supply and a satisfactory arrangement of automatic

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or non-automatic starting and intercepting valves. Second, the economical use of steam when speed is attained, as there are only two small cylinders or one large cylinder to supply at high pressure, while also, though the total range of steam expansion is increased, the range per cylinder is reduced, with a corresponding reduction in the variation of temperature and in resultant condensation." Now the first of these considerations affects performance mainly. The second bears directly on fuel and water consumption, and it is in this way that the properly designed compound locomotive is able to show economies in fuel and water consumption over the non-compound engine. But a third, and a very important consideration, is that of maintenance, and here the observer of commenced quite accurately represents my attitude on the subject of compounding. By way of concluding the discussion I will quote my concluding remark from the 1912 articles: "One cannot refrain from wondering why the excellent work which is performed constantly by well-designed compound locomotives in this country has not led to a more widespread adoption of the compound principle." Of the reasons given as to why this has not yet occurred the question of the cheapness of coal no longer arises, now that it has risen so enormously in price and its conservation is a matter of national importance. The question of the inherent defects of earlier systems of compounding also no longer has weight, with such successful examples as the Smith, the

Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

Holyhead express near Harrow.

4–4–0 4-cylinder compound No. 1926, *La France*, piloting, and 4–4–0 No. 282, *Alaric*, "Precursor" class.

running from "outside" is a good deal in the dark. It is safe to say that boiler maintenance, with the high steam pressures that rule in compound working, will reach a considerably higher figure than that of non-compound superheater engines working at 160 lbs. per sq. in. or so. Constructional costs and up-keep of cylinders and motion should not be much heavier, if at all, than in the case of a multi-cylinder simple locomotive. If one were better acquainted with this side of the question it would be easier to pronounce on the relative *ultimate* economy of the compound as against the simple engine: of the comparative economy in running there seems to be no doubt.

I do not think that the quotation from my friend's letter with which this article de Glehn-du Bousquet and the Maréchal-Henry systems before us. Only one obstacle therefore remains in the way, and that is the conservatism of British locomotive designers. But that conservatism has given way in very recent years before the advantages of superheating, and we may yet live to see the day when locomotive compounding similarly finds a widespread adoption in this country.

In turning to performance I am conscious of having neglected for some months the London and North Western Railway, and so will endeavour to repair the omission by describing some runs on a section of that line which has not often figured in these columns, *i.e.*, the Chester and Holyhead division. The loads over this route during the past summer have, I believe, surpassed

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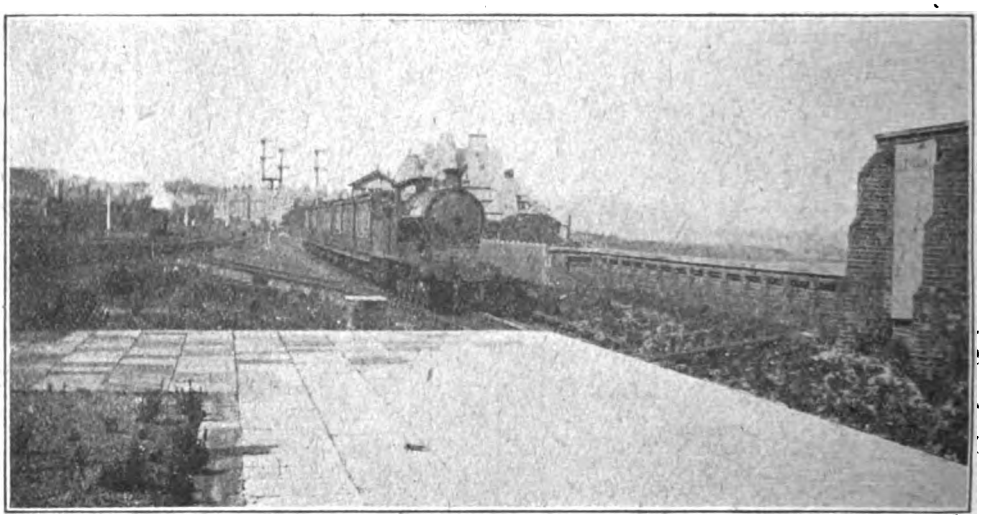
even London and North Western records, which is saying a good deal, and certainly those that I noticed were no exception to this rule, but a good many of the trains have been piloted regularly. Such was the case when I caught the 12.10 midnight from Chester to Holyhead: this is really a Manchester and Liverpool Irish express, but on the occasion of my journey was held for the first portion of the 8.45 p.m. Irish Mail *ex*-Euston, the two trains being amalgamated over the North Wales section. Consequently our load was one of 12 corridor 8-wheelers and two 12-wheeled sleepers, or 60 axles, totalling 435 tons empty and 460 tons with passengers and luggage: the engines were No. 985, *Sir W. S. Gilbert*, 2-cylinder super-



Photo] [*J. W. Idle.*

LONDON AND NORTH WESTERN RAILWAY.

Slow train approaching Colwyn Bay. 5 ft. 4–6–0 mixed traffic locomotive.

heater 4–6–0 of the "Prince of Wales" class, piloted—appositely enough, in view of the "Practice" part of this article—by the 4–4–0 Webb compound *Colossus*, No. 1912. The booked time of 93 min. for the 84½ miles is a smart one in these days, averaging as it does 54·5 m.p.h., for the Chester and Holyhead line is by no means dead level, and two slacks have to be observed—over the tubular bridges at Conway and the Menai Straits respectively.

However, we kept exact time. From Chester, after a falling start for 3 miles, the line is practically level for 34 miles to Abergele, with the exception of a number of short and sharp rises at different points, mostly not exceeding ½-mile in length. The initial descent produced a speed of 55 m.p.h.; after this the rate varied from 53 to 55½ m.p.h. until beyond Flint, rising thereafter to 60½ at Mostyn and 62½ at Rhyl. So Sandycroft, 5¾ miles, was passed in 8¼ min.; Flint, 12½ miles, in 15 min. 40 sec.; Mostyn, 20⅛ miles, in 23¾ min.; Rhyl, 30 miles, in 33 min. 20 sec.; and Abergele, 34¼ miles, in 37 min. 35 sec. We surmounted the 2¾ miles at 1 in 412 and ¾ at 1 in 100 past Llandulas with a minimum rate of exactly 45 m.p.h., and touched 65 m.p.h. beyond Colwyn Bay, passing the latter station, 40⅜ miles, in 44 min. 20 sec., and Llandudno Junction, 44⅜ miles, in 48 min. 20 sec. Easing very carefully through Conway, we again attained the mile-a-minute rate beyond Penmaenmawr, passing Llanfairfechan, 52¼ miles, in 57½ min., and Bangor, 59¾ miles, in 65½ min. On the rising grades to Menai Bridge (¾-mile at 1 in 163, 1½ at 220, and 3 at 660) we fell to 51 m.p.h., and then again slowed cautiously over the bridge. So the 6¼ miles from Bangor to Gaerwen took 7¾ min., but we touched 74 m.p.h. on the 4½ miles subsequent descent, only fell to 51 m.p.h. on the ascent past Bodorgan, and maintained between 60 and 61 m.p.h. past Ty Croes and Valley on to near Holyhead. So Bodorgan, 72½ miles, was passed in 79½ min.; Valley, 80⅞ miles, in 88¼ min.; and Holyhead was reached in 93¼ min., the

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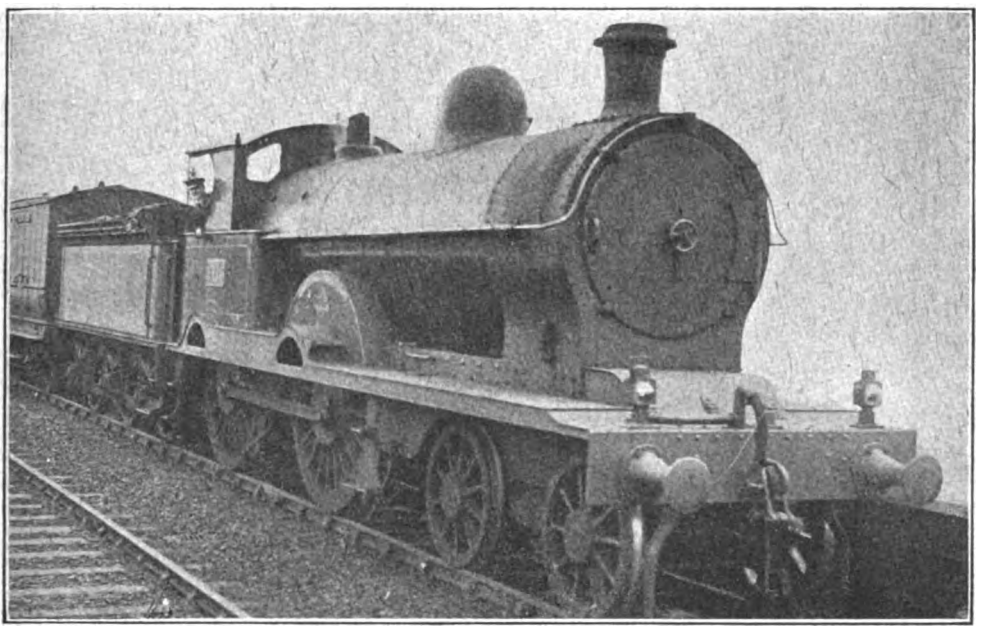
fractional excess over schedule being accounted for by the prolonged "crawl" to the platform in view of the length of the train.

From a Rochester friend I have received details of a run on the mid-day train (8.30 a.m. Irish Mail *ex*-Euston) which, as no pilot was provided, was an exceedingly fine effort, especially as no less than 8 min. were gained on the easier 102 min. schedule of this train from Chester to Holyhead. Yet the tare load was as much as 409 tons, and the gross load fully 430 tons, which was entrusted to the "Prince of Wales" class 4–6–0 engine *Lord Byron*, No. 1679. Starting very smartly lowest recorded speed was 43½ m.p.h. So it took 65 min. 5 sec. to pass Bangor, and 73 min. 20 sec. to Gaerwen; to Bodorgan the time was 79 min. 55 sec. and to Valley 88 min. 50 sec., the maxima beyond Gaerwen and Ty Croes being 71½ and 57½ m.p.h. respectively, while the intervening minimum on Bodorgan bank was 50 m.p.h. Eventually Holyhead was reached in the excellent time of 93 min. 55 sec., a departure from Chester 7¼ min. late being converted by this noteworthy effort into an arrival at Holyhead ¾ min. early.

Another correspondent's run in this direction I have previously mentioned in



Photo] [*J. W. Idle.*

LONDON AND NORTH WESTERN RAILWAY.

4–4–0 locomotive, No. 1115, *Apollo*, "Precursor" class.

indeed, the "Poet" passed Sandycroft in 8 min. 25 sec., at 57½ m.p.h., and then maintained from 62½ to 64 m.p.h. all the way from Flint to Rhyl, passing Flint in 15¼ min., Mostyn in 22¼ min., and Rhyl in 32 min. exactly. The lowest speed at Llysfaen was 40½ m.p.h., but 65 m.p.h. was touched beyond Colwyn Bay, the time to Colwyn Bay being 43 min. 20 sec. and to Llandudno Junction 47 min. 10 sec. The speeds beyond Conway, where the usual slack was made, were not quite so high as previously, the maximum at Llanfairfechan being 58½ m.p.h., while on the ascent to Menai Bridge the these columns, but it is worth repetition. The train concerned was the now long-cancelled 1.20 p.m. afternoon Irish express *ex*-Euston, and the load from Chester ten corridor 8-wheelers and two dining cars, totalling 52 axles, 371 tons tare weight, and 390 tons with passengers and luggage. Engine in this case was again a "Prince of Wales"—No. 2283, *Robert Louis Stevenson*. Sandycroft was passed in 8 min. 27 sec. from Chester; Flint in 15 min. 27 sec.; Mostyn in 23 min. 20 sec.; Rhyl in 33 min. 10 sec.; and Abergele in 37 min. 22 sec. No minimum speed at Llysfaen or elsewhere is recorded in

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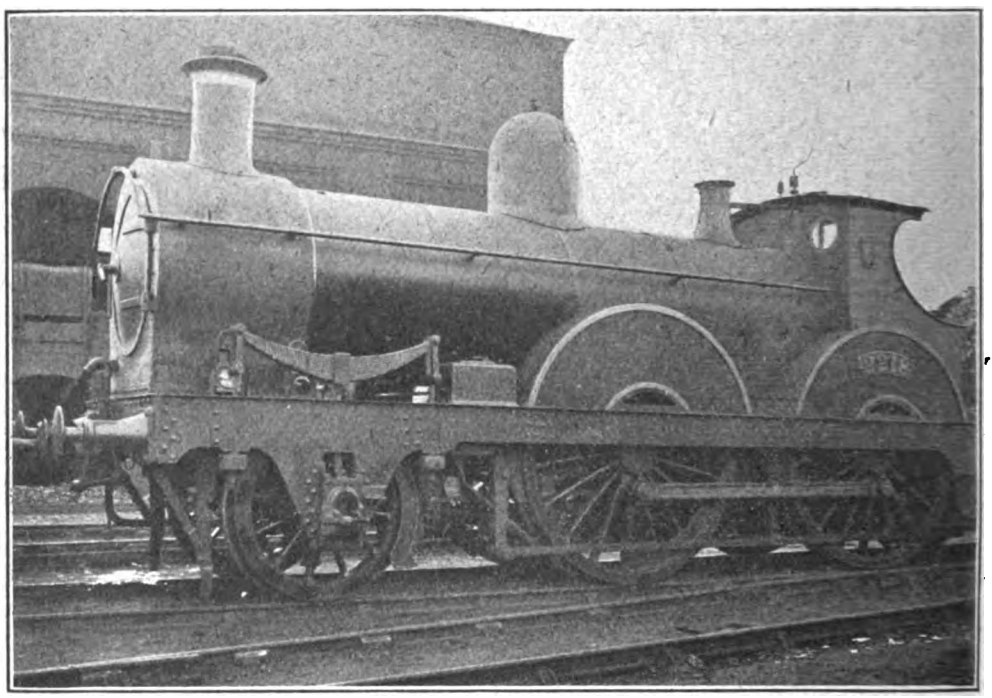
the log, but Colwyn Bay was passed in 43 min. 41 sec. and Llandudno Junction in 47 min. 27 sec. The usual slack was made at Conway, and a speed well in excess of 60 m.p.h. was attained beyond Penmaenmawr, the time to Llanfairfechan being 56 min. 57 sec., and to Bangor, where the customary stop was made, 65 min. 32 sec. for the 59¾ miles, or 2½ min. under schedule. From Bangor Gaerwen, 6¼ miles, was passed in 11 min. 3 sec., but as the speed down Gaerwen bank was particularly moderate, the time to Bodorgan was 17 min. 55 sec. first of these one of the small 6 ft. 6 in. 2–4–0's, known colloquially as "Jumbos," with seven mixed 8-wheelers and eight 6-wheelers, or fully 300 tons, passed Sandycroft in 8 min. 35 sec.; Flint in 15 min. 38 sec.; Mostyn in 23 min. 20 sec.; and Prestatyn Old Station, 26⅜ miles, in 29 min. 40 sec.; reaching Rhyl in 33 min. 53 sec. Between Flint and Prestatyn 8 consecutive miles were run in 7 min. 50 sec.—a fine effort on the level for an engine of such very moderate dimensions. No. 394, *Eamont*, of the same type, on a subsequent run passed Sandycroft



Photo] [*W. H. Whitworth.*

GREAT WESTERN RAILWAY.

2–4–0 engine, No. 2218, at Shrewsbury.

(12¾ miles), to Valley 26 min. 35 sec. (21⅛ miles), and to Holyhead, 24¾ miles, 31 min. 50 sec. The schedule time for this length used to be 34 min., so that a further 2 min. 10 sec. stood to the credit of the engine, making a total of nearly 4¾ min. from Chester.

Before turning to the up journey I may as well mention three runs between Chester and Rhyl which reached me some time ago from a correspondent in so remote a place as Port Sudan, and which well illustrate the work of some of the older London and North Western locomotive classes. On the in exactly the same time, Flint in 5 sec. less, Mostyn in 9 sec. less, and Prestatyn in 10 sec. less, but with a slower finish took 34 min. 10 sec. to reach Rhyl. The load on this occasion, however, was only 210 tons. Still finer times were made by the 4-cylinder compound No. 1976, *Lady Godiva*, at that time running in the form in which she was originally built. Sandycroft was passed in 8 min. 32 sec., Flint in 15 min. 16 sec., Mostyn in 22 min. 33 sec., and Prestatyn New Station, 26¼ miles, in 28 min. 25 sec.; and Rhyl, 30 miles, was reached in 32 min.

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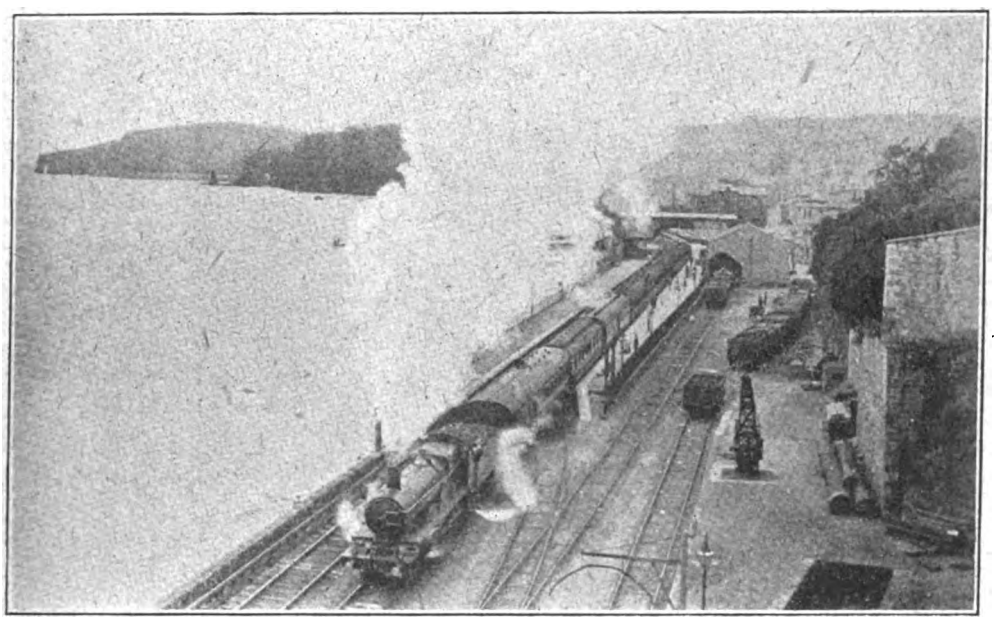
40 sec. For 12 miles beyond Holywell the speed on the level averaged 63½ m.p.h., with a load of five 8-wheelers and nine 6-wheelers, or 260 tons, behind the tender—a most creditable achievement.

And now for the up journeys. My own return trip from Holyhead commenced at the uncomfortably early hour of 2.20 a.m., the express concerned being scheduled to cover the 105¾ miles to Crewe without intermediate stoppage in 124 min. The load was the heaviest I have yet noted on the London and North Western Railway, consisting as it did of sixteen 8-wheelers, almost all of the latest

us 8 min. 10 sec. to pass Valley, 3⅝ miles; 18½ min. to Bodorgan, 12 miles; 26¾ min. to Gaerwen, 18½ miles; and 35 min. 10 sec. to Bangor, 24¾ miles. To this point we had lost nearly 2¼ min. on schedule, and the running thereafter continued to be undistinguished. The 15⅜ miles from Bangor to Llandudno Junction took 16 min. 35 sec., with a maximum of 61 m.p.h. at Aber and the usual slack at Conway; the 14⅜ miles thence to Rhyl occupied 16 min., with a minimum of 46 m.p.h. at Llysfaen and a maximum of 60 beyond; the 13¼ miles from Rhyl to Holywell Junction were covered



Photo] [*F. H. Stingemore.*

GREAT WESTERN RAILWAY.

Up express leaving Dawlish.
4-cylinder 4–6–0 engine, No. 4051, *Princess Helena.*

57 ft. stock, and a 12-wheeled sleeping car. Tare weight of this 70-axle train was 501 tons, and gross about 530 tons; the train engine—No. 5000, *Coronation*, 4–4–0 "George the Fifth" class—had as pilot a 4–4–0 compound, No. 1940, *Trafalgar*. The immediate start from Holyhead is on a rising grade of 1 in 90, and thereafter the grades are mostly unfavourable for the first 20 miles, save for the descent past Bodorgan. We attained 53 m.p.h. at Valley, fell to 39 on the 1 in 132–100 beyond Ty Croes, just touched the mile-a-minute rate on Bodorgan bank, and then fell again to 40 m.p.h. on the steep 4½ miles' ascent past Gaerwen. So it took in 14 min. 5 sec.; and the 14⅞ miles from there to Saltney Junction in 16 min. 10 sec.; total, 82⅝ miles from the start in 98 min. But now we were stopped dead for signals, and, having to start on the 1 in 200 and on a very sharp curve into the bargain, lost a good deal of time, the final 23⅛ miles from Saltney Junction to Crewe thus taking 35¾ min., and contributing to a gross loss of nearly 10 min. on schedule. Net time throughout may be taken as about 128 min., or 4 min. over the time allowed.

On a run with the mid-day up Irish Mail, however, my Rochester friend was a good deal more fortunate, and his run has added

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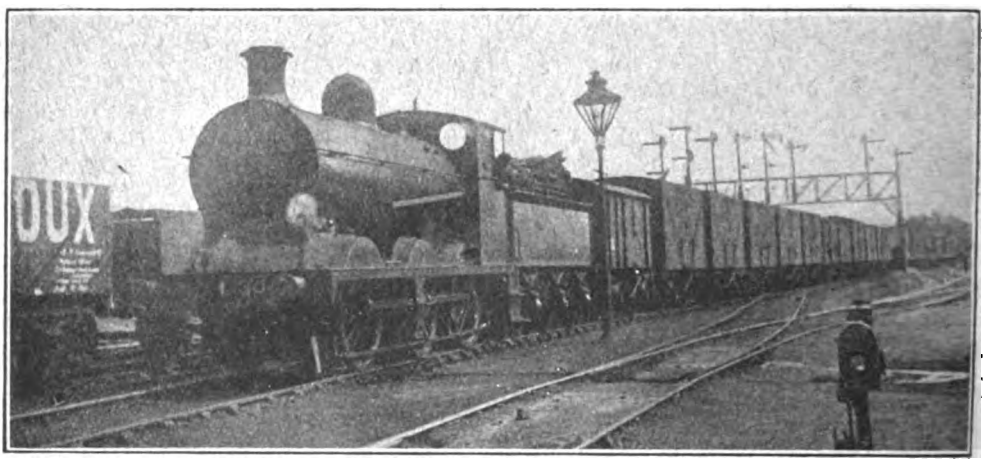
interest in that the engine was none other than the converted 4–6–0 *Prospero*, No. 1361, now a 4-cylinder superheater engine. The load was a substantial one of 391 tons empty, or 410 tons with passengers and luggage. In its very earliest stages the start of his run was slower than mine, but *Prospero* very soon had the measure of his load and began to do well. Valley was passed in 8 min. 50 sec., at 50 m.p.h., Bodorgan in 19 min. 25 sec. and Gaerwen in 26 min. 50 sec., the minima on Ty Croes and Gaerwen banks being 41 and 45½ m.p.h. respectively and the intervening maximum 66 m.p.h. Bangor was passed in 35 min. 5 sec., or almost exactly on time. On the falling grades to Aber a top speed of 67 m.p.h. was touched, Bangor to Llandudno Junction taking 15¾ min. (despite Conway slack); Llandudno Junction to Rhyl 15 min. 40 sec., speed reaching 66 m.p.h. on the descent past Llandulas. The 9⅞ miles from Rhyl to Mostyn occupied 9¾ min.; the 7⅝ miles Mostyn to Flint 7¾ min.; and the 6¾ miles Flint to Sandycroft, 7 min. 10 sec. Total time from Bangor to Sandycroft, 54 miles, was 56 min. 5 sec., and from Holyhead to Chester, 84½ miles, 99 min. 40 sec.—20 sec. under the working time of 100 min., and 5 min. 20 sec. below the advertised public time of 105 min. Adherence to schedule times was close throughout, and *Prospero* acquitted himself very creditably with so heavy a train.

Now on my journey from Holyhead I continued through to London, and as from Crewe forward we dropped only one of our 8-wheeled coaches, leaving 66 axles to go forward, but yet had only an unpiloted 4–4–0 "George the Fifth" class engine at the head of the train, I looked forward to obtaining some interesting data. The next booked stop was Nuneaton, 75 min. being allowed for this 61 miles' run. But I had reckoned without the elements. A drizzle was beginning to fall, and with the gross load, as nearly as I could estimate, of exactly 500 tons, the engine slipped so badly up the 1 in 177 of Madeley bank, that it was only by the most extraordinary efforts that the driver kept the train on the move. But we did at last breast Whitmore summit, having taken no less than 29¼ min. for this initial 10½ miles. Then, alas! being very tired and not expecting anything more of note, I fell asleep! Awakening as we were pulling up at Nuneaton, I found that we had covered the intervening 50½ miles from Whitmore—presumably including the usual slack at Trent Valley Junction—in the magnificent time of 53¾ min., which means that, 500-ton load notwithstanding, this 4–4–0 engine would, with a normal ascent to Whitmore on a dry day, have economised several minutes on the Crewe–Nuneaton stage. Further, the 14½ miles from Nuneaton to Rugby, rising for some miles from the start, were covered in the smart time, load duly considered, of 20 min. 50 sec After Rugby, with a "George the Fifth" and a



Photo] [*J. Macartney Robbins.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

0–6–0 engine, No. 304, at Willesden Junction, on through goods train from Horsham.

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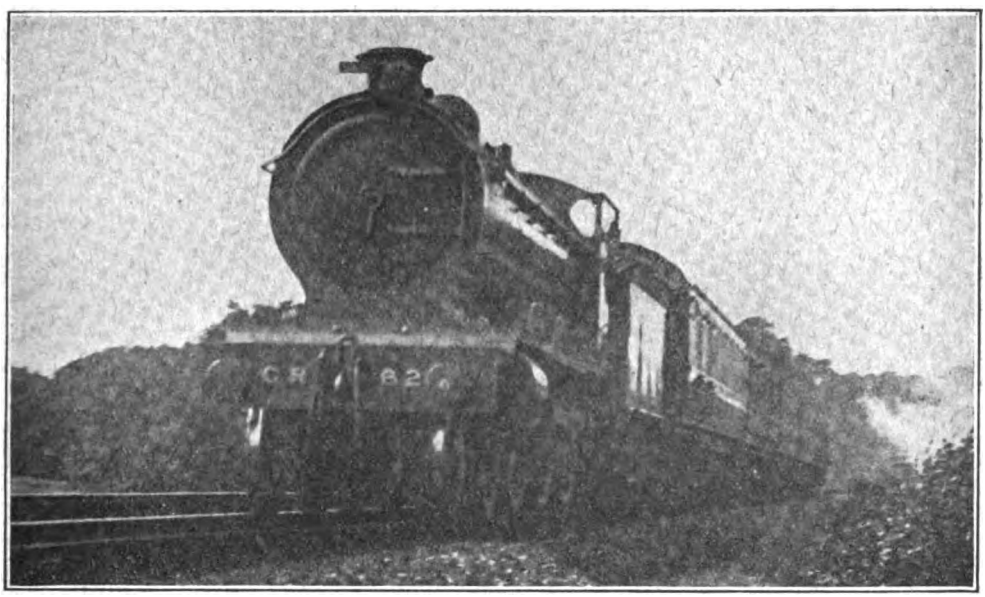
"Jumbo" at the head of the train, we did much more feebly on to London.

My only recent down run on the London and North Western Railway has been one on the 7.10 p.m. *ex*-Euston, booked non-stop to Nuneaton in 112 min., and this journey was extraordinary in its patchiness, good and bad work being sandwiched together in an almost bewildering fashion. The engine was No. 361, *Beagle*—superheater 4–4–0—and the load eleven 8-wheelers and a 6-wheeler, 311 tons empty and 325 tons full. I feel rather inclined to describe the journey in the way that the Russians write the dates of their calendar. Thus: Starting smartly, we Bletchley, 46·7 miles, was passed in 55 min. 20 sec.; Roade, 59·9 miles, in 69 min. 55 sec., at 45 m.p.h.; Weedon, 69·7 miles, in 80 min. 25 sec., at 60 m.p.h.; and Rugby, 82·6 miles, in 94 min. 40 sec., the lowest speed at Kilsby having been 50 m.p.h., and the highest rate beyond 62½. At so funereal a rate did we crawl through Rugby that, despite some good work on the rising grades to Shilton, where we did not fall below 53 m.p.h., we reached Nuneaton 40 sec. late.

On re-starting the same kind of performance recommenced. The Nuneaton start, in fact, was brilliant, Atherstone, 5·2 miles, being passed in 8 min. 10 sec.;



Photo] [*Ian G. Perman.*

CALEDONIAN RAILWAY.

1.0 p.m. express train from Glasgow (Central) to London.
New Pickersgill 4–6–0 superheater locomotive, No. 62.

passed Willesden in 10 min. 20 sec. at 56½ m.p.h. (old style), and then fell to 47½ m.p.h. beyond Pinner (new style). Watford was passed in 24½ min. from Euston (17·5 miles) at 55½ m.p.h., and the rate only fell from 55½ to 52½ m.p.h. on the 1 in 330 ascent beyond to Boxmoor (old style), but on the continuation of the same ascent to Tring the minimum was 48½ m.p.h. (new style). Tring, 31·7 miles, was passed in 41 min. 5 sec. Descending to Leighton the minimum was 70 m.p.h. (old style), but on the easy grades on to Wolverton, where the speed usually rules high, we gradually fell away to 52 m.p.h. (new style—very much so!). So Tamworth, 13 miles, in 15½ min.; and Lichfield, 19·2 miles, in 21 min. 35 sec., the maintained speed past Tamworth having been 67 m.p.h. This was distinctly "old style," but was followed by a dose of "new style" in a fall to 42½ m.p.h. up Lichfield "bank"! So sluggish, indeed, was the pace, that the 7·9 miles from Lichfield to Rugeley took 10 min. 5 sec., and the 9·4 miles from Rugeley to Stafford 12¼ min.! We had thus dropped another 55 sec. on the booking of 43 min. from Rugby. Between Stafford and Crewe the running was unashamedly "new style," as we actually took 34 min. 5 sec. for the 24·5 miles, losing a clear 2 min. on the

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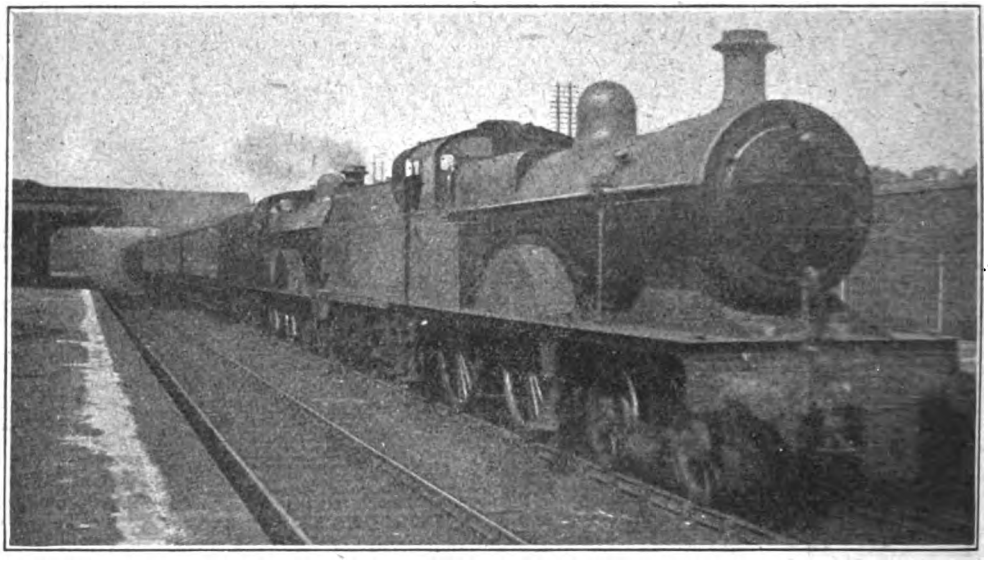

Photo] [*F. H. Stingemore.*

MIDLAND RAILWAY.

Up stopping train at Radlett.

Pilot, Johnson 4–4–0 No. 709 (now superheated). Train engine, non-superheater rebuilt, No. 419.

easy 32 minutes' allowance! I need hardly enlarge on my feelings when, a quarter of an hour after my arrival at Crewe, *Captain Fryatt*, one of the newest "Claughtons," came in dead on time on the 7.30 p.m. Highland express with a train of 12 big 8-wheelers and three sleeping cars, of which the tare load alone was 465 tons. "Entrain in haste and repent at leisure" is a motto that I shall have to bear in mind in the future.

Several correspondents have taken me to task in respect of a palpable error in my last month's article. Such a point-to-point time as 23 min. from King's Cross to Hitchin, 31·9 miles, would indeed call for terrifically "energetic uphill work," but it must have been obvious to most readers that by Hitchin I meant Hatfield. Again, the maximum speed of the 11 a.m. *ex*-Waterloo at Sherborne, by a transposition of figures, read 97 m.p.h. instead of 79 m.p.h., which latter was the correct figure.

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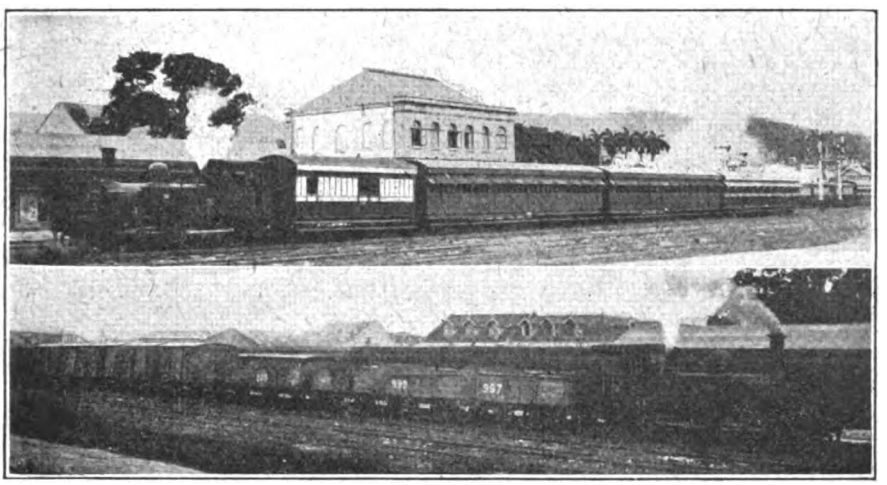
Trinidad Government Railway.

By R. W. A. SALTER.

ALMOST parallelogramic in shape, with the longer axis lying north and south, the island of Trinidad is the southermost of the Antillian group of islands. It is situate between 10° and 10·50° north of the equator and 61° and 61½° west longitude, in the southern part of the Caribbean Sea. The Gulf of Paria and the narrow channels of the Bocas separate it from the mainland of Venezuela. In point of size Trinidad holds second place amongst the British West Indies, being about 55 miles long and 40 miles wide. With the neighbouring island of Tobago, which possesses no railway, it forms the Crown Colony of Trinidad and Tobago, conducted by an Executive Council and by a Legislative Council, both presided over by one Governor.

Port-of-Spain, the capital, is situated on the shore of the Gulf of Paria, the latter which affords excellent harbourage for the largest vessels. The town stands on the site of the old native village Conquerabia, and is populated by about 60,000 persons. With streets wide, cleanly kept, lighted at night by electricity, and traversed by a good tram service, and with telephones in constant use both privately and for business, Port-of-Spain gives one the impression of a town thoroughly up-to-date.

San Fernando, the second town, 35 miles by rail from the capital, and placed near the Gulf of Paria, has a population of 10,000. Here and there tall chimneys indicate the presence of sugar factories. The largest of these factories has an annual output amounting to 16,000 tons. Other towns of importance are St. Joseph, the ancient Spanish capital, Arima, Sangre Grande, and Princes Town.



TRINIDAD GOVERNMENT RAILWAY.
A passenger train and a goods train.

The total population of the Colony of Trinidad and Tobago was estimated in 1910 at 351,422.

With the exception of certain tramways employing animal traction, and used in connection with the shipment of sugar from the estates, the railway system of Trinidad dates from July 1st, 1876, when the first portion of a line from Port-of-Spain to Arouca (almost due eastward 12 miles) was opened for public traffic. On August 31st following a further extension of 3¼ miles was made to Arima. The receipts in 1877 were

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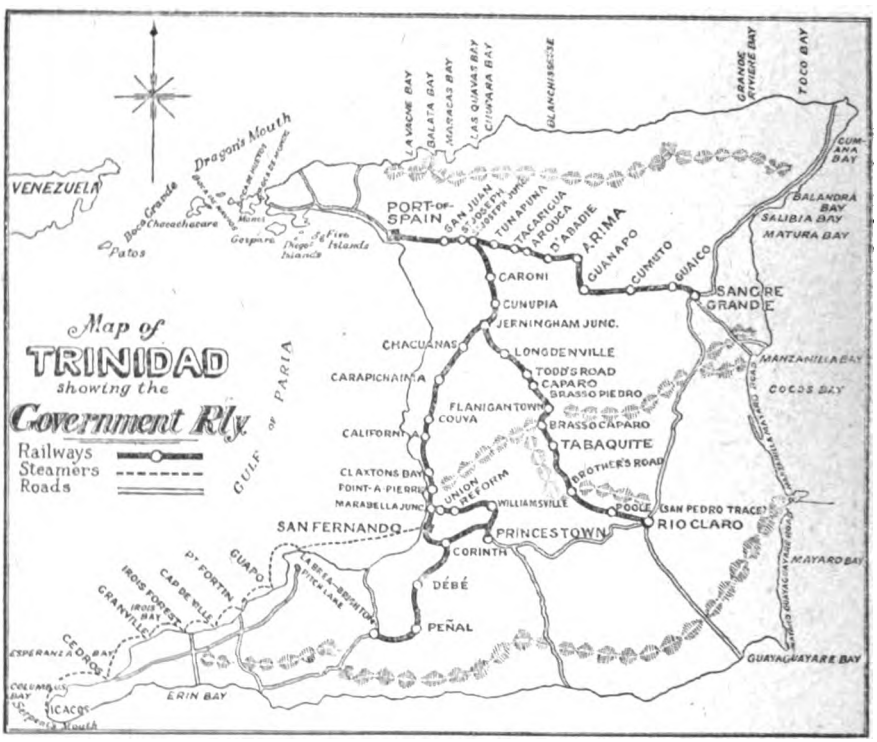
£19,097, and the working expenses £11,557, the capital at that time being £175,472.

Since then, at various periods, the railway has been lengthened as follows:

Southward the Port-of-Spain–Arima line, through the sugar-growing district to Couva (17½ miles), opened March 1st, 1880; to Claxtons Bay, 1881; to San Fernando in 1882; to Princes Town in 1884; from Arima to Guanapo (3 miles), 1896; and to Sangre Grande in 1897; the Caparo Valley line following in 1898. In 1913 and 1914 the San Fernando–Siparia, and the Caparo Valley extension to Rio Claro, respectively, brought the total mileage owned to 123½ miles, of which 115 miles are worked by the Railway Department of the Government, the remainder being leased.



The system is single line, standard 4 ft. 8½ in. gauge, with 9 ft. native hardwood sleepers having angle fishplates, and a 60 lb. B.S.S. steel rail. Stations for the most part are constructed of timber, on raised platforms 20 in. above rail. Junctions and crossings are signalled and interlocked, and traffic is worked either by Tyer's electric tablet system, or by staff and ticket.

Parts of the colony are flat and liable to flood in the heavy tropical rains experienced; hence the bridge spans are numerous, averaging about 3½ to the mile. The largest are 3/100 ft., 125 ft., and several 100 ft. The southern line, Port-of-Spain to San Fernando (35 miles), traverses the sugar-growing districts, and is level, having no works of importance except for a few river bridges. Further south, however, between San Fernando and Siparia, the country is hillier, and the work of a heavier character. This also is true in regard to the diverging lines amongst the central and southern ranges of hills, where there are two short tunnels. The whole country is densely covered with forest growth, through which it was necessary to build the lines. The courses of the railway may at this point be summarised as follows: (1) in an easterly direction to Sangre Grande, for the

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Manzanilla coast; (2) southwards to San Fernando, thence east to Princes Town; and (3) centrally to Tabaquite, in the heart of the cacao district.

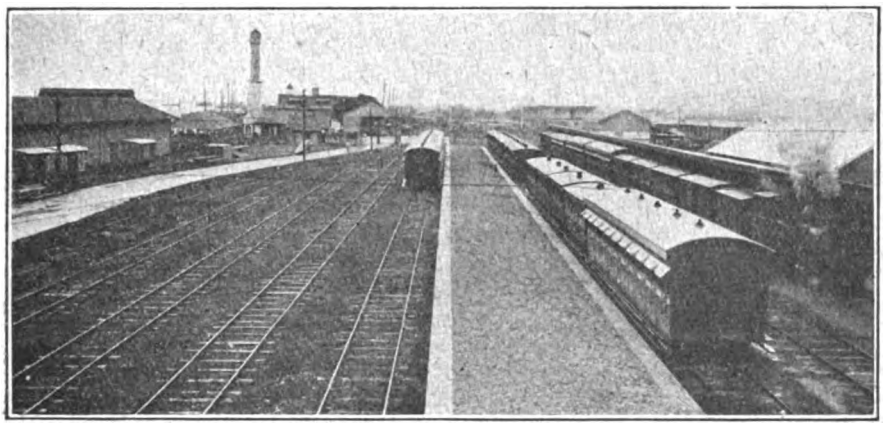
Traffic consists mainly of produce, including the carriage of sugar-cane to the numerous factories for manufacture, sugar and cocoa for shipment, native fruits, timber, and latterly petroleum products, general merchandise, and road-making materials. The total tonnage moved per annum is approximately 270,000 tons. Passengers carried in a year total 1,500,000. The average receipts from each person are under 1s.

The railway has 18 locomotives of the 4–4–0 type, and 6 smaller engines. Passenger rolling-stock is of two types, the older

Pitch Lake, at La Brea, it might be mentioned, is a wonderful deposit of bitumen, covering 114 acres. Oil-tanks holding 7,000,000 gallons have been erected in its vicinity. The small island of Gasparillo possesses some remarkable stalactite and stalagmite caves, rivalling in beauty Fingal's Cave in Staffa.

There is a passenger service of three trains daily each way between all points of the system, excepting Sundays, when there are two trains. Goods trains run in both directions each week-day. For this purpose the system is divided into three sections, extra trains being added as required.

Reference to the accompanying sketch-map prepared by the writer will indicate



TRINIDAD GOVERNMENT RAILWAY.

Platforms at Port-of-Spain station (temporary) and part of yard looking West. Station was in course of re-building, but the work has been stopped for the duration of the war.

4-wheel stock, similar to less recent English patterns, of which there are 55 vehicles with 14 brake-vans; the newer type of bogie coaches, each set on two 4-wheeled bogies, of which there are 23 vehicles.

Goods equipment consists of two classes, 6-ton and 10-ton wagons, numbering in all 559, and 8 travelling-tanks. These are all of the 4-wheeled type.

The Government Railway Department owns three steamers, from 100 to 350 tons displacement each, which ply in connection with the railway between San Fernando, calling at La Brea for the celebrated Pitch Lake at the oil fields, and Cedros, the south-western point of the island; and maintaining the islands and Boca service at the north-western corner of the island. The

the several stations situated in their respective positions on the railway.

For passengers there are provided three classes of accommodation, viz., first, second and third. The single fares for short distances range from 3d., 2d. and 1d. per mile respectively, and to 2½d., 1½d. and 0.88d. per mile, at 40-mile distances. In all cases return fares are figured at 1½ the single fares. In addition there is a suburban service of six trains in both directions each day within 10 miles of Port-of-Spain which is made available at lower rates.

Goods rates vary from 1½d. per ton-mile for road metal to 2½d. per ton-mile for cocoa and sugar, in accordance with the ordinary common carriers' conditions. The tariff of rates and fares is fixed, on the

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motion of the Governor of the colony, by the Legislative Council referred to in the opening paragraph of this article.

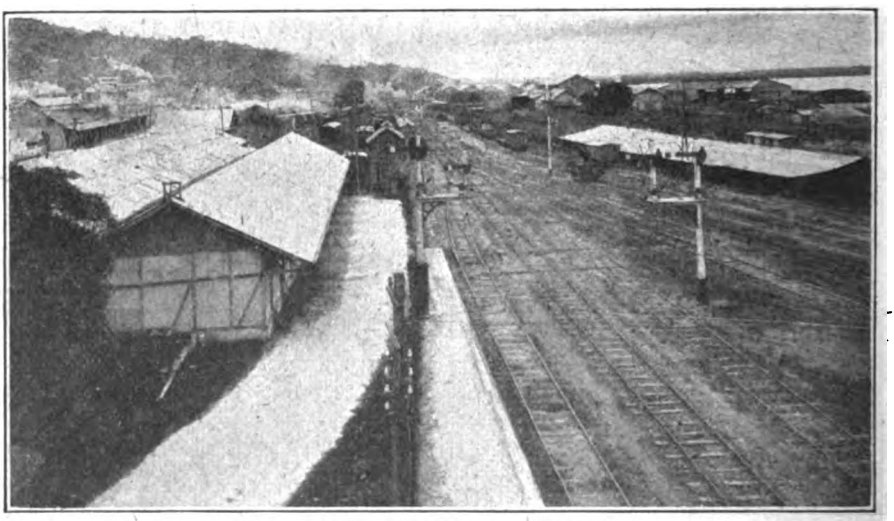
The principal items in an average year's traffic are :—

Sugar transported	..	16,500 tons
Molasses ,,	..	2,472 puncheons
Rum ,,	..	1,537 ,,
Cocoa ,,	..	15,800 tons
Sugar-canes carried to manufacture	..	72,000 ,,
Road material carried	..	30,000 ,,

Receipts per train-mile are from 4s. 6d. to 5s., and the expenditure from 3s. to 3s. 3d., exclusive of interest on loans. Average receipts per ton of goods conveyed are approximately 3s. 9d. Working expenses in proportion to receipts figure at about 65 per cent., exclusive of interest. The average return on capital expended is 3¾ to 4½ per cent. Receipts from all sources per mile of line open total about £1,150 per annum. Expenditure is on an average £770 per mile per annum. Train mileage for a year is 560,000.

It has been mentioned previously that Port-of-Spain is provided with a tram service. The electric cars work from 6 a.m. to 11 p.m. A single fare by any one of the five routes costs 3d.

Trinidad is the West Indian headquarters of the Royal Mail Steam Packet Company, and transhipment to the northern islands and to Demarara is effected there. In normal times the mail steamer arrived from Southampton *viâ* Barbados each alternate Tuesday, proceeding to Colon, Jamaica, and New York, and on the intervening Tuesday left for the home voyage. The steamers also of seven or more other British companies entered the Gulf of Paria to receive or dis-



TRINIDAD GOVERNMENT RAILWAY.
Part of Port-of-Spain station yard looking East.

embark cargo and passengers at Port-of-Spain; and there was regular communication with other parts of the world, including Havre, Hamburg, Amsterdam, and Genoa. These items will indicate the importance of Trinidad to Britain as a trading island.

In conclusion the writer acknowledges his indebtedness to Mr. H. R. Marwood, General Manager and Chief Resident Engineer of the Trinidad Government Railway, for the statistics quoted in this article.

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The Easingwold Railway.

By G. W. J. POTTER.

WITHIN the district served by the North Eastern Railway—practically a monopolist area—there may be found certain small independent passenger railways as distinguished from private colliery lines of which there are many, though the latter do not cater for passenger traffic. These are the North Sunderland Railway, situated in Northumberland, and running from Chathill (North Eastern Railway) to Seahouses; the South Shields and Marsden in Durham, a colliery line but conveying passengers; the Nidd Valley Light Railway, and the Easingwold Railway in Yorkshire.

All the companies have their own engines and passenger vehicles, and are thus distinct from lines worked or leased by the North Eastern Railway. It is somewhat curious to note that the carriages in use on the North Sunderland Railway are old ones obtained from the Highland Company; while the Nidd Valley has purchased Metropolitan Railway stock; and the Easingwold, which formerly possessed old North Eastern coaches, has now some discarded vehicles from the North London Railway.

The Easingwold Railway has the distinction of being the shortest passenger line in the United Kingdom, barely 2½ miles in

Photo] [*Locomotive Publishing Co., Ltd.*

EASINGWOLD RAILWAY.

1. Easingwold station. The old carriage on struts is used as a potato store.
2. Easingwold Railway train. Carriages were formerly used on the North London Railway.

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length—to be accurate, 2 miles 37 chains. Further, it is interesting as being really a light railway—though of course built to standard gauge—and constructed before the passing of the Light Railways Act.

Easingwold is a quiet town of about 2,000 inhabitants, distant about 13 miles from York, and 10 from Thirsk. Agriculture is the chief industry of the district, but the town is still celebrated for the manufacture of steels for cutlery purposes. The chief thoroughfare, known as Long Street, is broad and open, and contains several pleasant looking and substantial old houses. There is also a market place of about 2 acres in extent.

It may be recalled that the main line of the North Eastern Railway runs in a northerly direction from York through the midst of pastoral and agricultural country, and usually at a considerable distance from the chief roads; hence arises the fact that Easingwold is about 2½ miles from Alne, the nearest station. Communication used to be maintained by an omnibus which ran three times a day between these points. Naturally, the cost of haulage along the road for farm produce, manure, lime, coal, etc., was heavy, so the inhabitants decided to obtain railway communication with the rest of the Kingdom if at all possible. A company was formed with a capital of £12,000, subscribed chiefly by the leading local residents. The necessary Parliamentary powers were obtained in 1887. Construction was begun, and the line was opened for traffic in the month of July, 1891. The total cost of the line appears to have been about £17,000. For a few years no dividend was paid, but the traffic continued to grow, and a dividend of 4 per cent. has been paid now for several years.

The first locomotive used on the line was named *Easingwold*. Built by Hudswell, Clarke and Co. in 1891 (Maker's No. 334), it had cylinders 12 in. in diameter and 18 in. stroke, with six-coupled wheels of 3 ft. 1 in. diameter. About the year 1903 this machine was sold to a firm of contractors, and when the new station at Sculcoates, Hull, was being built, could be seen working there. Its successor, similar but larger and more powerful, bears the inscription Easingwold Ry. Co., No. 2 on its sides. Built by the same firm in 1903 (Maker's No. 608) it has cylinders 13 in. by 20 in., six-coupled wheels of 3 ft. 3½ in. diameter, and the working pressure is 150 lbs. The empty weight is slightly over 20 tons. Coal capacity is 1 ton and water 550 gallons.

Passenger vehicles are three in number, comprising two composite, first and second, carriages and a brake van, obtained, as has been stated, from the North London Railway. Nine trains daily each way was the liberal pre-war allowance. Third class tickets are only issued by the first train in each direction, and passengers ride in the second class compartments. The single fares are 6d., 4d. and 3d. Tickets are of the North Eastern pattern. Through bookings are in force between Easingwold and twelve North Eastern stations.

Eight minutes is the usual time taken for the running between the termini, but as all trains are liable to be used for mixed traffic, this is likely to be exceeded when the load is heavy. Goods rolling stock is provided by the North Eastern Railway. The staff usually consists of about a dozen men: one stationmaster, one clerk, three or four porters, two platelayers, two drivers, one fireman, and one guard.

Leaving Alne station from a bay platform on the up side, the line bends quickly to the right, and then crosses a road on the level. Continuing its course eastward a bridge of about 10 ft. span over a small stream is encountered. This stream runs into the River Kyle, which falls into the Ouse at Newton-upon-Ouse, so eventually the waters of the Easingwold district reach the North Sea by way of the Humber. Further on another level crossing is met with, and shortly afterwards the train slowly comes to rest, by the aid of hand-brakes only, at the miniature platform of Easingwold station.

As the country is fairly level and there is an absence of any sharp rises, the track was laid as a surface line, and the steepest gradient is 1 in 100. The Vignoles type of steel rail is employed, and these are spiked direct to the sleepers.

The Easingwold Railway has been, on the whole, a successful undertaking, and its career shows that railways of this type if carefully managed and not unduly burdened with legal expenses—the curse of railway enterprise in England—can be made to pay and to give a moderate return to the proprietors.

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British Railway Service and the War. [XX.]

IN the House of Commons recently, Dr. Addison, Minister of Reconstruction, announced that the whole question of the future of the railways was under the consideration of a special Committee appointed by the President of the Board of Trade, on which the ministry is represented.

Whatever may be the outcome of the deliberations of the Committee referred to by Dr. Addison, there is no doubt that the problems in railway management and control raised by the war will not altogether come to an end when the war is over.

The subject is one that occupies a prominent place, not only in the minds of railway managers, but likewise in the thoughts of the staff still engaged at transport work in the homeland and of those who are similarly employed overseas or in the armed forces of the Crown.

Railway problems after the war are succinctly dealt with in a recently published pamphlet by Mr. F. A. McKenzie,* and his remarks upon the subject may be aptly quoted here. He writes :—

A new era has begun in railway management, and it will be impossible to go back completely to pre-war conditions. Even if it were possible it would be highly undesirable. While no definite schemes have yet been arranged, it can safely be foretold that there will be greater unity of administration when peace returns than in the old days before war came. Co-operation has proved to be better than cut-throat competition. In the old days the Railway Clearing House at Euston provided the machinery for a limited amount of co-operation, but one dissentient could often hold up great reforms. The Railway Executive Committee of to-day is almost certain to develop into a permanent central body which will act as the coherer, the organiser, and the Supreme Court of Appeal among railways themselves, when rival schemes threaten conflict. This central body will promote economy of effort. It will prevent extravagant and excessive competition, and it will, if wisely guided, hold the scales evenly between the triple claims of the railway proprietors, the railway employees, and the general public.

The second problem is that of wages. Practical railwaymen maintain that under normal conditions it will be impossible to pay, when the companies emerge once more from Government control, anything like the war bonus of 15s. per week per man now received. Any attempt to revert to the pre-war wages would probably plunge us into a labour war. What will be a fair and practical wage for the men after the war is over? How can it be paid? If a substantial increase on the pre-war rates is found necessary—as many think it will be—how are the companies to meet it? Are they to be allowed to maintain higher passenger rates or to increase freight charges? If so, will these higher charges mean increased revenue? It is an axiom of management that low fares mean heavy traffic. Here is a matter which will demand the most careful consideration of both railway managements and the men's leaders.

The third problem is that of the future of women's labour on the railways. The companies have promised that men who have left them to serve with the Colours will be reinstated on their return in positions equal to those they left. That promise must be kept, and kept to the full. But, unfortunately, many of the men will never return. Women have been found such efficient railway servants that they are certain to be retained. Many branches of railway employment before the war exclusively held by men will, a few years hence, be wholly or almost wholly in women's hands. How can the change which has already taken place be made permanent without strife?

The changed conditions after the war may, of course, provide in themselves a solution for all these possible problems. In the great rush of work to be done when the world is to be repaired, when ruined countrysides are to be rebuilt, great cities re-equipped, and the waste of war made good, there will be for a time at least a demand for labour greater even than the supply afforded by a gradually demobilised army.

* British Railways and the War. London: The Menpes Printing & Engraving Co.

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It has been the experience of other generations that a successful nation emerging triumphantly from a hard-fought war has in itself such springs of hope, enthusiasm, and inspiration that the impossibilities of other days are tackled and overcome. The British railways may at least hope that, having solved the problems of war traffic and employment in unequalled fashion, they will master the lesser problems of the coming days of peace.

Two of the men of the Cheshire Lines Committee have been decorated for their bravery and resource in action. The particulars are: Private George Sammons, King's Liverpool Regiment, awarded the D.C.M. for keeping his Lewis gun in action, although wounded in the neck, and continued until wounded the second time, after which he brought his gun back to our lines himself, the rest of his team having become casualties. He was a clerk employed at Cuddington, in Cheshire, and is now making a good recovery from his serious wounds. Sapper C. R. Crawford, Royal Engineers, awarded the Military Medal for a very smart piece of work in the recent "push." The Engineers, who were following up the infantry, were actually the first to reach this particular objective, took it, inflicted heavy casualties upon the enemy, and within 30 minutes had informed headquarters by telephone that the position was in their hands. He was a clerk in service at Hartford station, in Cheshire.

Lieut. W. J. Smith, Yorks. and Lancs. Regt., who was killed in action in France recently, was, previous to joining the Colours, employed as a carriage cleaner on the Midland Railway at St. Albans, and took a great interest in ambulance work. The deceased officer's advancement from the lowly railway position in question is as creditable as it is remarkable. He enlisted in the Bedfordshire Regt. September 4th, 1914, was given his first stripe in four days, his second in ten days, and was made sergeant within six months. He was granted a commission as second-lieutenant in March, 1917, and was recommended for promotion to lieutenant to date from August 17th. He was 34 years of age. His portrait appears on this page.

LATE LIEUT. W. J. SMITH, Midland Railway.

Many RAILWAY MAGAZINE readers in the service of the Great Eastern Railway learned with regret of the death of Second-Lieut. Roland C. Chilvers, of the London Regiment, who was killed in action a few months ago. In May, 1909, he entered the Great Eastern Railway service in the Accountant's Office at Liverpool Street, being transferred to the London Cartage Committee in September, 1913. He enlisted as a private in the H.A.C. in November, 1914, subsequently receiving a commission in the London Regiment. Lieut. Chilvers was the younger son of Mr. J. Chilvers, for over a quarter of a century stationmaster at Wood Street, Walthamstow. Lieut. Chilvers was 23 years of age at the time of his death.

A correspondent writes: "One of the most praiseworthy schemes for cheering our wounded soldiers arriving at or passing through Derby has recently been inaugurated at the Midland station by the female ticket collectors and porters. Recently it was noticed that when a train of wounded soldiers arrived at Derby these women, with money from their own pockets, purchased packets of cigarettes for distribution. An officer of the company, seeing this, called the women together, and a plan was prepared whereby each one gives a penny or twopence per week and collects what she can. By this means in the last fortnight more than £1 has been obtained and spent. A weekly balance-sheet is drawn up, showing the amount collected, spent, and in hand. There are no official expenses: every penny is spent in cigarettes and matches, and all are presented to the wounded soldiers, who are highly gratified."

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper right-hand corner, and address them to the Editor. Questions relating to the names, numbers, dates, dimensions, etc., of locomotives should not be forwarded, and queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE. *Queries should not be of purely local interest. Correspondents are requested to write on one side of the paper only, and they must give their names and addresses, but a pen-name or initials may be inserted for Editorial use.*

Speed of Goods Trains.

The average speed of slow or "pick-up" goods trains, including the duration all stoppages and time lost in shunting for passenger and other trains, is probably not above 10 miles per hour, the running speed itself being about 20 miles per hour. As regards heavy through coal, mineral and goods trains, inclusive of stops for engine purposes, shunting, etc., it may be taken that the overall average rate is more like 15 or 20 miles per hour. Perishable and urgent traffic is, however, conveyed at much higher speeds, and immediately prior to the war there were a number of express goods trains, composed of continuous-braked stock, run at on different railways average point-to-point speeds averaging from 40 to nearly 50 miles per hour. The fastest of these carried "express passenger" headlights, and were signalled and dealt with precisely as express passenger trains. Goods traffic on Sundays and public holidays is confined mainly to through goods and empty truck trains, and these are limited in number as far as possible, in conformity with the general custom of this country as regards Sunday traffic.

[Reply to L. CHR. LARSEN.]

Fishguard to London "Records," Great Western Railway.

Probably the fastest running yet achieved between Fishguard and London was that which followed the first arrival of the s.s. *Mauretania* of the Cunard Company at Fishguard on August 30th, 1909. Three trains were run to Paddington, the first, conveying the mails, taking 4 hrs. 28½ min. on the journey of 261¼ miles, the second, with passengers, 4 hrs. 37 min., and the third 4 hrs. 53 min. Their respective weights were 55, 274 and 281 tons, and stops of from 2½ to 4 min. were made at Cardiff in each case. On these runs the 4-cylinder 4-6-0 *King George* covered the 145¼ miles from Cardiff to London with 55 tons in 138½ min., while the similar engine *King Edward* achieved the more remarkable feat of completing the same distance in 142 min. with 274 tons. In 1907 non-stop runs were made on several occasions between London and Fishguard by the special Killarney excursions, the journey being scheduled in 5 hrs., but in practice generally occupying a few minutes less.

[Reply to R. MURPHY.]

Fixing of Superheater Elements, Midland Railway.

The superheater elements of Midland Railway locomotives are fixed in a special manner devised by Mr. Henry Fowler, Chief Mechanical Engineer, and Mr. E. G. Anderson, Chief Locomotive Draughtsman. The element tubes are similar to those employed in the Schmidt superheater, but in order to do away with the necessity for a cast steel header in the smoke-box into which to lead the upturned tubes, the latter are expanded into collars, and these are secured to a cast iron header by means of a loose gland securely bolted in position with a 1 in. diameter stud and nut. For further details, together with photographs and drawings of this and other special superheater arrangements on the Midland Railway, see our contemporary, the *Railway Engineer*, for October, 1912.

[Reply to RALPH B. WALLIS.]

The Forth Bridge.

Total weight of steel employed in the construction of the Forth Bridge was a little over 54,000 tons. Some 6½ millions of rivets, weighing 4,000 tons, were required to hold the structure together. In addition to this the piers and shore viaducts absorbed 740,000 cub. ft. of granite masonry, 46,300 cub. yds. of rubble masonry, 64,300 cub. yds. of concrete, and 21,000 tons of cement. Painting of the steelwork, which totals 135 acres, goes on continuously, and takes three years to complete, during which time 120,000

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lbs. of paint are used up. Total length of bridge and approaches is 2,540 yds., or a fraction under 1½ miles, and the aggregate cost of construction was three million pounds. There is a clear headway of 150 ft. under the bridge at high spring tides.

[Reply to WM. HUGHES.]

American Locomotives.

By "bare" we assume you refer to the high raised running plate leading from the cab over the wheels to the leading end of the engine, whereby the driving wheels are exposed, as compared with the British practice of covering the upper half of them with "splashers." It would be difficult to explain this and other differences of design between British and American or foreign locomotives have arisen, except in so far as engine design has developed on original and characteristic lines on both sides of the water, without much interchange of ideas. In addition engines built on bar instead of plate frames, as practically every American locomotive type, nearly always carry this high running plate clear of all the wheels.

[Reply to P. B. C.]

London, Brighton and South Coast—London and North Western Locomotive Exchange.

In this exchange a superheater 4–4–2 tank of the Brighton Railway was exchanged with one of the London and North Western "Precursors"—No. 7, *Titan*—for the through working of the "Sunny South Special" between Brighton and Rugby. No details of the trials worth mentioning have been published, except that the Brighton tank is generally understood to have acquitted herself exceedingly well. The London and North Western Railway 4–4–2 tanks, until the advent of the 4–6–2 superheater engines, made even longer runs than the Brighton and Eastbourne journeys from London on the London, Brighton and South Coast Railway, but are now confined more to shorter distance trains.

[Reply to W. B. MOWBRAY.]

4-2-2-0 Engines, London and South Western Railway.

The only advantage to be obtained in leaving uncoupled the driving wheels of these engines is that of reducing the frictional resistance to high speed offered by coupling rods, seeing that coupling is not necessary in this case to increase the adhesion weight of the engine. On the other hand the coupling of the wheels would prevent the slipping to which either pair of driving wheels is more or less subject when the engine is in steam. The question of lack of synchronisation in the working parts arises in a compound locomotive, where one pair of cylinders is receiving the steam exhausted from the other, but would hardly affect the working of engines of this type.

[Reply to G. F. W. HAMEL.]

Some Locomotive Queries.

Great Central Railway engine *City of Lincoln* is a superheated 4–6–0 with 6 ft. 9 in. wheels. "PN" on the cabs of Great Western Railway locomotives indicates that they are stabled at Old Oak Common sheds, or are, virtually, "Paddington" engines. The Great Northern Railway has no 4–6–0 locomotives at present, either for goods or passenger service, and we cannot say whether any engines of this wheel arrangement are contemplated. Great Western Railway 4–6–2 engine No. 111, *The Great Bear*, takes her turn on ordinary working. We do not undertake to give locomotive dimensions. See rules at head of these columns.

[Reply to W. C. HUNT.]

White "Diamonds" on Signal Posts.

Diamond shaped plates enamelled white are affixed to the posts of numerous starting and advanced starting signals on the Great Northern, Midland, London and North Western and other lines to indicate that the line at these points is track-circuited, and that "train waiting at signal" indicators are provided in the signal-box concerned. This arrangement obviates the necessity in these cases of the fireman walking to the box (in observance of the well-known Rule 55) in order to remind the signalman of the presence of the train at his signal.

[Reply to "DAN."]

"Claughton" Class Engines, London and North Western Railway.

Boilers of above engines have an external diameter of 5 ft. 2 in., and are uniform in this respect with those of the "Precursor," "Experiments," "George the Fifth" and "Prince of Wales" classes. You are not correct in stating that this diameter is less than in the case of the express locomotives of every other line, and if these boilers supply sufficient steam under all normal working conditions, no object would be attained in further increasing their dimensions, and with them the weight of what are already very heavy engines.

[Reply to REV. A. J. THOROLD.]

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London and North Western Railway Shunting Engines.

The most recent shunting engines built on the London and North Western Railway have the 0–8–2 wheel arrangement, but these are intended mostly for marshalling trains in those sidings where sorting is done by gravity, and steep grades have to be negotiated. Prior to that Mr. Webb's ultimate shunting design had the 0–4–2 arrangement of wheels, but comparatively few of these were built. Generally speaking, the standard shunting engines on the London and North Western Railway, in point of numbers, is the familiar 0–6–0 type with saddle tank.

[Reply to A. E. BAKER.]

Pre-war Express Trains, London-Liverpool, London and North Western Railway.

Distance given in "Bradshaw" between Euston and Lime Street, Liverpool, is 192¼ miles, but this is incorrect, being the distance to Edge Hill station, whereas Lime Street is 193⅛ miles from London. The fastest pre-war down express was the 6 p.m. "diner" *ex*-Euston, which ran non-stop to Edge Hill in 3 hours 28 min., and reached Lime Street at 9.35 p.m. In the opposite direction the fastest trains were the 9.45 a.m. and 5.20 p.m. *ex*-Lime Street, both running to Euston in 3 hours 55 min.

[Reply to LIEUT. DOUGLAS PETTIGREW.]

Early 4-6-0 Engines.

The first 4–6–0 tender engines in this country were designed by the late Mr. David Jones for the Highland Railway, and were completed by Messrs. Sharp, Stewart and Co. in 1894. These had 20 in. by 26 in. cylinders, and were probably at the time of their construction the most powerful locomotives in the British Isles. The earliest English 4–6–0 express engine was Mr. William Dean's No. 100 on the Great Western Railway, built in 1902; it is now numbered 2900, and bears the designer's name.

[Reply to A. G. L. M.]

The Wellingborough Accident.

This disastrous derailment of September, 1898, was occasioned by the fact of a postmen's barrow, with which some boys were playing, having dropped on the line in front of the approaching 6.45 p.m. Manchester dining car express from St. Pancras. The barrow became entangled in the bogie of the engine—No. 1743 (original numbering), 4–4–0 type—which was derailed just north of the station and completely wrecked, the major part of the train suffering the same fate.

[Reply to RALPH B. WALLIS.]

Midland 0-6-0 Locomotives.

The last locomotive classification showed the Midland Railway as possessing 1,495 0–6–0 tender engines, 21 per cent. of the total of this wheel arrangement in the country, and almost exactly 50 per cent. of the total Midland stock. The Midland has nearly twice as many 0–6–0 engines as its nearest rival in this particular—the North Eastern Railway, with 777. There are several different types of 0–6–0 engine on the Midland, as they do not all belong to one class.

[Reply to OWEN R. JONES.]

Locomotive Exhaust on the Midland Railway.

Absence of the customary "petticoat" under the Midland chimneys may and probably does affect the sound of the exhaust given out by the engines of that company in the way you mention. But it would be difficult, if not impossible, to define the exact reasons governing the variation in sound given out by the exhaust of different locomotive types, other than those detailed in the reply to A. Cocking in the October issue.

[Reply to L. J. PARKES.]

Driver and Fireman's Positions.

It is claimed that the reason for the driver on most British railways being on the right-hand side of the engine, is that it is much more convenient for the fireman, who in order to fire right-handedly has to stand on the left-hand side. If the driver is on the left-hand side, the fireman has to fire round the driver's legs, which is not very convenient, unless the driver stands well up on a raised platform in the extreme left-hand corner.

[Reply to R. G. LINDSAY.]

Through Carriages.

There are at present two trains with through carriages daily between London (Waterloo) and Swanage (one in each direction). These are the 9.35 a.m. *ex*-Waterloo and the 12.45 p.m. *ex*-Swanage. The former train has carriages for Weymouth and Swanage, the two portions being divided at Bournemouth Central—the Weymouth portion leaving at 12.53 p.m. and the Swanage portion at 12.58 p.m.

[Reply to R. W. CLARKE.]

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London and North Western—London Brighton and South Coast Locomotive Exchange.

Locomotives concerned in the exchange in 1909 were No. 7, *Titan*, a 4–4–0 of the London and North Western Railway "Precursor" class, and the London, Brighton and South Coast superheater tank engine No. 23, of the 4–4–2 type. The trial took place between Brighton and Rugby, the two engines making the complete journey on alternate days.

[Reply to C. R. SIMMONS.]

Some Geographical Problems.

Great Northern Railway branch from Stafford to Uttoxeter crosses the North Staffordshire Railway Colwick-Stone section by an overbridge near the Weston station of the latter. At Gravesend it is the North Kent section of the South Eastern and Chatham Railway that is carried over the branch from Farningham Road to West Street station.

[Reply to K. P.]

The Steam Brake.

The steam brake is operated by a simple steam cylinder, usually fixed in a vertical position, the admission of steam into which ejects a piston connected to a system of levers applying the brake. Suitable spring or other arrangements are employed in order to take the brake off again as soon as the brake-valve is shut.

[Reply to W. S. UPTON.]

Stroudley's Front Coupled Locomotives.

There are at the present time, 26 passenger tender engines and 111 passenger tank engines of this type still running. These may be seen at any part of the London, Brighton and South Coast Railway system. These locomotives are employed on local and light main line passenger services.

[Reply to CORPORAL C. H. DUNK, R.E.]

Midland Railway 2-4-0 Engines.

The 2–4–0 engines of the Midland are decidedly capable of "moderately fast main line trains," seeing that in former years they were entrusted with practically all the express passenger traffic. Now they are employed mostly on slow passenger trains, and as pilots to heavy goods and coal trains.

[Reply to OWEN R. JONES.]

Great Western Railway "Record of Records."

Referring to the answer given in the November RAILWAY MAGAZINE we are informed by Mr. H. Margrie that the highest speed attained by the 4–2–2 engine was one of 91·8 miles per hour for two miles in the neighbourhood of Taplow.

[Further reply to A. DAVIDSON.]

Great Northern Railway (Ireland).

Several 4–4–0 locomotives belonging to this railway are to be re-built with superheaters at Dundalk Works, but owing to the difficulty in obtaining materials the work is greatly delayed.

[Reply to J. MACARTNEY ROBBINS.]

4-6-2 Tender Locomotives.

There is only one 4–6–2 tender locomotive at present running on the standard gauge in this country, viz., Great Western Railway, No. 111, *The Great Bear*.

[Reply to V. McCURDY.]

French Railways.

Lord Monkswell's book on French railways is mailed to RAILWAY MAGAZINE readers serving with the Overseas British Expeditionary Forces on receipt of 4s. 1d.

[Reply to T.G.A.M. and others.]

A Never Used Railway.

The line from Iron Acton to Frampton Cotterell on the Thornbury branch of the Midland Railway has never been used. The rails were taken up many years ago.

[Reply to R. GOODCHILD.]

The "Claughtons" and Birmingham, London and North Western Railway.

We believe that individual engines of the "Claughton" class have worked into Birmingham (New Street), but that so far they do not do so regularly.

[Reply to OWEN R. JONES.]

Longest Viaduct in the British Isles.

This distinction belongs to the Tay Bridge of the North British Railway, which has a total length of 10,711 ft., or just over 2 miles.

[Reply to RALPH B. WALLIS.]

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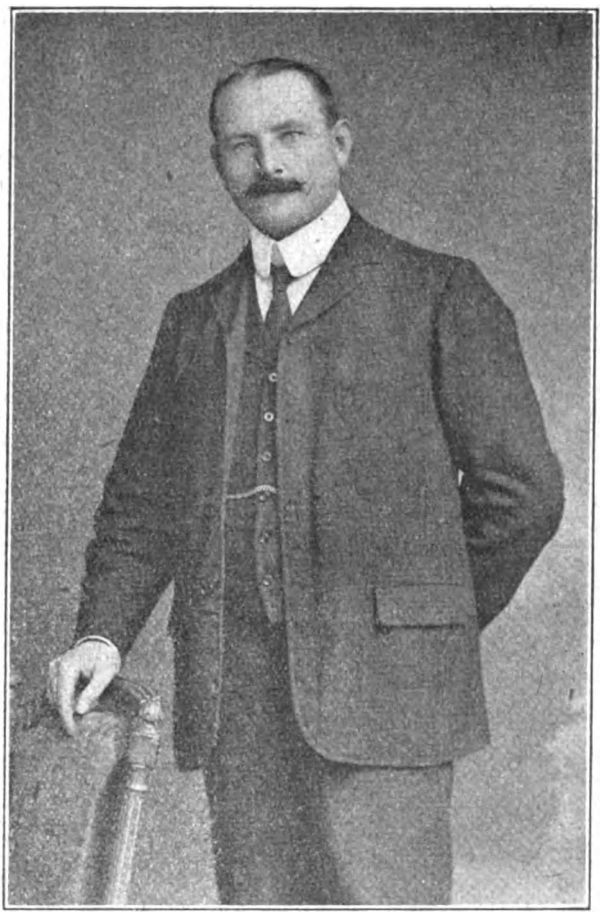
RETIREMENT OF AN IRISH RAILWAY MANAGER.



MR. P. McCARTHY,

General Manager and Receiver, Listowel and Ballybunion Railway. (Lartigue Single Rail System.) 1890—1917.

ANNUAL visitors to that most popular of Southern Irish summer resorts, Ballybunion, will learn with regret that Mr. P. McCarthy, Manager of the Listowel and Ballybunion Railway, has found it necessary to retire owing to ill-health. Mr. McCarthy has been manager for over twenty-seven years. Those who can recollect the beginning of the enterprise can well remember its hard struggle for existence, and its many reverses. However, under Mr. McCarthy it was able to survive its difficulties until eventually it became established on a firm basis, and now the line occupies a foremost position among the light railways of Ireland. Mr. McCarthy realised that success depended entirely upon the progress of Ballybunion and accordingly he devoted all his efforts towards this objective, with the result that it is now one of the most popular seaside resorts in Ireland. It is to be regretted that his efforts have proved too much of a strain on Mr. McCarthy's health, and his many friends sincerely hope that his well-earned rest will soon restore him to his former vigour. Mr. McCarthy received his railway training on the Waterford, Limerick and Western Railway. He entered the service of the Listowel and Ballybunion Railway in 1888 and occupied the dual position of stationmaster at Listowel and accountant to the railway until appointed General Manager in October, 1890.

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A NEW CANINE COLLECTOR AT EUSTON.

"BULLER," whose photograph in the company of Inspector Cassidy, is here reproduced, has succeeded "Brum II." as collecting dog at Euston station, London, for the London and North Western Servants' Benevolent Fund, and he promises to be a very worthy successor.

Every dog has his day, and as was foreshadowed in the RAILWAY MAGAZINE, July, 1917, "Brum II.," whose friendly bark of thanks had become so familiar to his many patrons during the many years he had collected for the Fund, has had to give way to one of a younger generation. "Buller" is a striking specimen of his species, and has entered into his business with much intelligence, and has already made a large number of friends, as is evident by the support he has received. He and his master are inseparable friends, and neither appear to have anything to learn in the way of appealing to the charitable.

"BULLER."

Please send this magazine post free to the troops. It may be handed over the counter at any post office in the United Kingdom without wrapping or address. No postage need be paid. Do it to-day.

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PERTINENT PARAGRAPHS

The King's School, Peterborough.

A PROMINENT figure at the recent annual speech day of this ancient educational establishment, was Mr. Alfred Aslett, General Manager and Secretary of the Furness Railway.

In Mr. Aslett, the "Old Petriburgians" of the King's School possess a noteworthy president, and the following paragraph culled from the *Peterborough Advertiser* demonstrates that in the old-time city on the Nene his worth is recognised and acknowledged just as freely as it is in the railway world. The writer remarks :—

"Mr. Alfred Aslett, the President of the Old Boys' Association of Peterborough King's School, is the General Manager of the Furness Railway Company. In Speech Day proceedings he took a great interest and proposed a vote of thanks to the Bishop for his kindness in presenting the prizes, and also to the Dean for presiding. Many of the older residents of the City will remember the family. Young Aslett, now the distinguished railway manager, 'learned his profession' on the Great Northern Railway at Peterborough, after a distinguished career at Kings. He is still a rare sport, and old Peterborough cricketers will remember his prowess, especially when he lionised by taking four wickets with four successive balls. He was manager of the Cambrian Railways after leaving Peterborough. He is a welcome guest at the Deanery, and stays there during his Peterborough visits. He possesses a delightful personality, the old boys are proud of him, and the new boys look upon him as an exemplar."

Photo] [*Campbell, New York.*

MR. ALFRED ASLETT.

General Manager and Secretary, Furness Railway.

Liskeard and Looe Railway.

To supplement his article in the November RAILWAY MAGAZINE, Mr. Hopwood has furnished particulars of the engine *Caradon*, which are as follows: Built in 1862 by Hopkins, Gilkes and Co. (the firm that supplied the other two engines), their works number being 138. Cylinders 13 in. by 24 in.; coupled wheels, 4 ft. in diameter. The maker's numbers of *Cheesewring* and *Kilmar* were 195 and 264 respectively.

Llanidloes-Llangurig Railway.

IN our November issue, particulars were given of a suggestion to re-open the railway line from Llanidloes to Llangurig and our west-country contributor, Mr. T. R. Perkins, expressed some opinions not exactly favourable to the scheme. Following this a London reader of the RAILWAY MAGAZINE, Mr. R. D. James, who claims some acquaintance with Welsh railways, has written in support of the proposals. Mr. James remarks: "Before considering its possibilities, it would be preferable to eliminate from the mind the original idea of Manchester and Milford Railway, and to consider this later scheme as a new through route between Aberystwyth, Builth, Llandrindod, Brecon, Hereford and the thickly peopled territory of the Brecon and Merthyr, Rhymney and allied lines. Anyone travelling, as I did some years back, from Aberystwyth to Brecon, would appreciate the shortening as compared with the great 'roundabout' *viâ* Machynlleth and Moat Law Junction, and this remark applies to all the places mentioned previously, where there is a vast holiday traffic to Aberystwyth and other coastal resorts. I don't regard it as a local line at all any more than, say, Clarbeston Road to Fishguard Harbour, but one local station between Llangurig and Strata Florida might create a tourist traffic for the lovely mountain region around Plynlimmon. As to whether the Cambrian Railways would fall in with the idea of a shortened route of course opens up quite another question, from the public view. I believe some years ago a scheme developed for extending the little Devil's Bridge Railway to Llanidloes or Rhayader, but the gauge difficulty arises at

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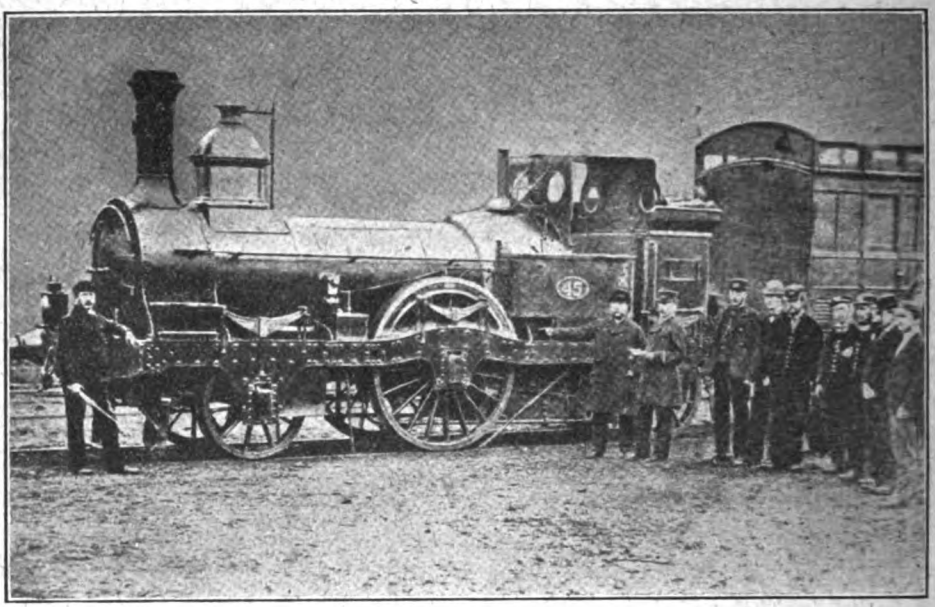

SHARPE SINGLE ENGINE, NO. 45.
Great Northern Railway.

A SHARPE SINGLE ENGINE ON A STANDARD TRAIN OF THREE COACHES.
Great Northern Railway.

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once then, so I fear if there is anything in the scheme at all it lies in the direction of the adjacent Lampeter and Aberayron Railway as a model of what could be accomplished by a light railway."

A Pair of Old "Sharpies."

Two old photographic prints, kindly lent to the RAILWAY MAGAZINE by Mr. Sinclair, the District Locomotive Superintendent of the Great Northern Railway at Peterborough, are reproduced on the opposite page. These engines are Sharpe singles, or, as they were known in their day "Sharpies." They were originally tender engines built in 1848 and subsequently converted to tank engines as seen in the illustrations, with Bridges and Adams radial axle boxes at the trailing end. They were used on the Spilsby branch of the Great Northern Railway and one of the photographs shows the standard train of three coaches and one of these engines at Spilsby station, Lincs. They ran mixed passenger and goods trains mostly, and each engine made a trip to Boston, Lincs., once a week to have the boiler washed out. The cylinders were 15 in. by 20 in., and the leading and trailing wheels 3 ft. 6 in. diameter and the single driving wheels 5 ft. 6 in.

It will be noticed that when photographed engine No. 45 had the Stirling chimney while the other engine had the original chimney fitted by Sharpe Stewarts. So it would seem that one engine had undergone some form of modification. There is also a slight difference in the cabs.

In the photograph of engine No. 45 the fireman is seen standing in front of the smokebox. This man but recently retired from the position of driver with the Great Northern Railway. The driver of the engine is seen alongside the firebox with a sealskin hat on. The engines were broken up in the year 1880 or thereabouts.

Conscience Money.

A RATHER remarkable letter was recently received by the Chief Accountant of the South African Railways in which a conscience stricken passenger enclosed a money order for £2 3s., being an amount owing to the railway authorities for several years, but unknown to them. From the writer's statement it seems that some years ago he was travelling on the railways with his child, the age of the latter exceeding the three years' free limit by just eight days. So trifling was the excess—at any rate, so it then seemed in the eyes of the parent—that he neglected to take out a ticket for the youngster, and it travelled free. But later years and the force of religious influences have brought a change of views, and the writer, as he says, "not wishing to have the sin any longer on his conscience," remits the amount of the fare. It is to be hoped, remarks the *South African Railways and Harbours Magazine*, that other and more serious offenders will follow the excellent example thus set, and hasten to send in the amounts they owe.

It was once said of an English archbishop who lived during the Victorian era that he troubled more than most men over the sinfulness of little sins, and it is evident, from the letter mentioned above, that such "troubling" is not confined to archbishops. Not that we would suggest for a moment that it is a little sin to rob a Railway Administration, but when we look at this conscience-produced letter, with its "only eight days," and then think of the unblushing attempts (sometimes successful) frequently made to "do" the railway authorities, we can but wish that similar influences to those which produced this unusual remittance may be brought to bear upon greater and more hardened sinners.

Railway Methods in New South Wales.

GIVING evidence before the royal commission (Mr. Tom Johnson) appointed to enquire into the methods of railway working in Victoria, Mr. James Fraser, Railway Commissioner, New South Wales, explained the departmental practice in New South Wales regarding the appointment, as between capital and working expenses, of the cost of new locomotives and improved facilities for handling traffic.

There was a sinking fund in operation at one time in New South Wales, he said. For many years it had not been added to, but, on the other hand, had been reduced for other purposes. Mechanical coal-handling appliances had been installed at a number of locomotive depôts. Steel castings were now being made in the department. This practice was extremely economical, the steel furnace showing a profit of 45 per cent. per annum. Steel castings were now being used where more expensive forgings would have been employed formerly. Modern forging machines had been installed during the past two years. One of these machines had dispensed with 42 men, of whom 14 were blacksmiths and 28 strikers. Since the war the staff had been reduced as much as industrial awards would permit. At crossing loops the staff, consisting of three men at each place, had been entirely eliminated by the provision of automatic appliances, which were operated by the guard of the train.

It has been decided to take over from the lessees all the railway refreshment rooms, and about 90 per cent. of them were now being run departmentally. After debiting the department with the whole of the rentals previously received from the rooms, the cost of the carriage of materials used, and a fair rent on the cost of the buildings, there was a profit. This profit would be very substantial when the department had control of all refreshment rooms. The public also, was better served than under the old leasing system.

Owing to the increased cost of materials and wages, freights and fares had to be increased in New South Wales last December. Freights were increased all round by 10 per cent., except that coal was exempted and the rate for live stock was increased by 15 per cent. Including the increases, he believed that the rates for primary products, except live stock, carried

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on the New South Wales railways were lower for most distances than the corresponding rates in Queensland or Victoria. A factor in this result was the longer average haul in New South Wales. Latterly, the truck loads had been considerably increased by the introduction of new regulations. During last April the department carried 1,800 tons more in 200 fewer trucks, as compared with April, 1916.

German Railways and the War.

"F.A.B.," a RAILWAY MAGAZINE reader in a position that makes him an authority on the subject, has written concerning the article under this caption in our November issue.

Allow me, he remarks, to correct a wrong impression which was conveyed by your Swiss correspondent as to the increase in fares in Germany. There has been no increase in fares up to the present.

The surtaxes mentioned have been *authorised* in the Prussian Diet by the Law of April 8th of this year, but they have not yet been applied. These charges represent a direct tax and will be paid to the Treasury. The Railway minister has also *proposed* an increase of 10 per cent. in the fares.

The latest information is to the effect that owing to the large increase in traffic by the express and fast trains a proposal has been sanctioned to levy supplementary fares by these trains amounting to about 100 per cent. of the fares. It is also proposed to curtail the service on Sundays (at present the service on Sundays is the same on the Continent as on week-days) so as to give the staff more rest and to save coal.

It is interesting to note how the German Government have so far been able to throw dust in the eyes of the public by not increasing the fares and by keeping up a train service varying but little from the peace time schedules. The time has, it seems, now arrived when they are no longer able to maintain this farce, and the German public will soon have a rude awakening.

The Straightest Railway in the World.

IN the last June RAILWAY MAGAZINE, under the heading of "Straight Line Records," from 22 to 26 mile stretches of straight line in this country were mentioned. But these figures pale somewhat before the record of the Buenos Aires and Pacific Railway, to which belonged until recently the peculiar distinction of having on its system the longest straight stretch of railway in the world. The length of this is 205½ miles and it is situated on the main line between miles 158 and 363½ from Buenos Aires. The straight was formerly broken by reverse curves forming a detour round the lake Soria; the longer portion was then 175 miles long, and was even then the world's record. The lake having, however, practically dried up, the Company have suppressed the curves, and the "cut-off" was opened to service on October 15th, 1907.

It seems that when the line was set out in the early 'eighties, when the country was in the hands of the Indians, after leaving Junin, which was a military outpost, and the last point of contact with the Buenos Aires civilisation, the line was laid out straight across the flat "pampas" until it met another survey line about 60 miles long, which was pushed out eastward from the western terminus, Villa Mercedes. There were no obstacles of importance to avoid and hence the phenomenal "bee line." The direction of the line in question is about 13 degrees north of west (W. 13° N.). It is a single line (except about 5 miles at its east end) and constructed of 100 lbs. flange rails spiked to native hardwood sleepers. It is practically level, the total rise from east to west being only 600 feet, distributed fairly uniformly, giving an average grade of 1 in 1,800, with a maximum grade of 1 in 200. It contains 28 stations.

For the foregoing particulars the RAILWAY MAGAZINE is indebted to Mr. Frank Reeves, M.I.C.E., M.Amer.Soc.C.E., Chief Engineer, Buenos Aires Pacific Railway, but the Argentine stretch in question does not now, however, hold the world's record for straightness. For the new Transcontinental Railway of Australia has a length of no less than 330 miles across the Nullarbor Plain—an area as wide as the whole of France—without a single curve. The whole railway is 1,030 miles long and will open up vast tracts of the country for cultivation, while at the same time halving the time of transit across the continent. It was in October last that the final spike—a golden one—of the Transcontinental Railway was driven and the line declared open.

Grand Trunk Affairs.

MR. A. W. SMITHERS, Chairman of the Board of Directors of the Grand Trunk and Grand Trunk Pacific Railways, as reported by a Canadian correspondent, was asked, when in Vancouver recently, whether the Grand Trunk Pacific would take over complete and control the Pacific Great Eastern Railway. Mr. Smithers declared that up to the present the matter had not been under discussion, and that it would be time enough to deal with it whenever the opportunity arose and whenever the occasion demanded it. In the meantime the Grand Trunk and the Grand Trunk Pacific companies had their hands sufficiently full with their own affairs.

Dealing with the matter of the westward movement of grain, Mr. Smithers said: "It is naturally out of the question that it will come westward this year or perhaps next; indeed, I may say while the war is in progress. At the same time, I wish to repeat that we are ready just as soon as it is decided that wheat will be shipped to the Pacific Coast as, I might add, we have always been."

In reply to questions as to the financial position of the Grand Trunk, Mr. Smithers stated that they had a clean slate up till the end of this year. "Everything is provided for," he remarked, with a smile of satisfaction, "and the outlook for the year 1918 is, I may say, a bright one. Our plans for the future are not, of course, completed as yet, but they are such that I may say we anticipate they will be of a satisfactory character."

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Mr. Smithers added that, so far as he could see, there was no indication that the Dominion Government would be approached for financial assistance.

This year, continued Mr. Smithers, it was quite evident that the acreage under cultivation for all sorts of crops was much larger than was generally known, and he believed that next year would be another record-breaker in this respect. Just now they had no new works on hand, though after the war it was probable that the race for business would be keener than ever.

Splitting Distant Signals.

In a recent issue of the *Railway Review* appeared a letter headed "Removing Signals," which complained that the North Eastern Railway was removing what were described as directing distant signals—generally known as splitting distants. What has happened, says the *Railway Gazette*, in response, is that the company has, somewhat late in the day, followed the example of all the other leading railways and dispensed with those distant signals which lead into loops, through cross-over junctions or through other junctions which call for a reduced speed. The signal for continuing along the straight route remains, but it can only be lowered to follow the stop signal for the straight line; in other words, it cannot be pulled off when the line is made for a diverging route. The effect of this, or, at least, what is aimed at, is that should a diverging movement have to be made the distant will be "on" and so cause the driver to reduce his speed. In its issue a week later than the first mentioned the *Railway Review* had another letter on the subject, the contents of which showed that the writer did not know his subject. He talks as though the company was abolishing distant signals entirely, and says "it makes one nervous to think what will happen in the day time, and much more in the dark and foggy weather." To which we would reply that in all states of weather a driver will, when approaching a signal-box, find a distant signal which will tell him whether or not he must reduce his speed.

Single Line Working.

To the last July Railway Magazine Mr. C. H. Palmer contributed an article on "The Working of Single Lines of Railway in Great Britain." In it the writer referred to the exchange of staves and tablets and mentioned the apparatus in use on the Great Western Railway which enables the staff to be exchanged at 15 miles an hour.

To supplement Mr. Palmer's article Mr. Robert Baker, engineer of the British section of the Kowloon Canton Railway, has written to inform Railway Magazine readers how the work is performed in the Far East. "On this line," he says, "we use the Neales Ball Tokens, which are inserted in a leather pouch attached to a cane loop about 18 in. in diameter. These can be exchanged, and are so daily, at all speeds up to 40 miles an hour, but it requires one station hand, usually a porter, to receive the used token from the fireman, and a second man, usually the stationmaster, who stands some 30 or 40 yards further along the platform to offer the new token. One end of the cane loop is continued straight for a foot or so, like the letter P, in order to form a more convenient means of holding it up. This end may be inserted in the end of a bamboo rod if any danger is anticipated, but the bamboos are not used on this railway, and so far we have had no accidents. The receiving man on the platform has to be smart and swing round, as it were with the train, the moment he receives the token or he might get a nasty knock on the back. At night the fireman shines a lamp on to his loop and the stationmaster does the same on to his so that the loops are plainly visible to the persons receiving them."

The Railway "First Lord."

Railwaymen, both officers and rank and file, were greatly interested in the first speech made in the House of Commons by Sir Eric Geddes in the capacity of the First Lord of the Admiralty—for in spite of his position in the Government Sir Eric is still a railwayman. Of the London newspapers, perhaps the description of the scene was the best described by the *Daily Telegraph*, who observed:—The House of Commons, after hearing the First Lord of the Admiralty deliver his first speech, must have ceased to marvel at the rapidity of his rise to fame. It is true that he read his long statement from beginning to end and that it suffered to a certain extent from that circumstance. But Sir Eric Geddes is a big man, with a big, round, full voice, and as he stood there squarely at the box, and spoke with authority, and confidence, he certainly took the fancy of the House of Commons which is apt to be very critical towards men who have made their reputation outside its walls. Mr. Asquith congratulated him warmly upon his "lucid and comprehensive" statement, and said that it had told the House exactly what they wanted to know. So Sir Eric Geddes has achieved the same feat which Mr. Fisher so successfully accomplished a few months ago, that of scoring a great Parliamentary success with a maiden speech delivered as an important Minister of the Crown. The First Lord rarely changed his attitude during the 75 minutes that he was addressing the House, but every now and then he leaned over the box with folded hands upon his heap of typewritten papers, and solidly emphasised his points. A strong, capable, resolute man of affairs, with a cool head and a firm will—such was the impression created by the First Lord's statements.

Early Eastern and Midland Railway Engines.

Our correspondent, who supplied the information concerning these engines (see page 361, November Railway Magazine), now states that on October 26th he saw one of the 4–4–0 side tanks on the Great Northern Railway at East Goods Yard, Holloway. The engine was painted

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black and numbered 52 (this was not the number of the engine when running on the Midland and Great Northern Joint Railway). It had recently arrived from Melton Constable, and was evidently *en route* for a military camp railway "somewhere in England."

The writer refers to the coincidence that at the time he was reading the paragraph in question, he looked up momentarily and saw from the carriage window one of the engines described. Probably this is the only occasion on which an engine of the Midland and Great Northern Joint Railway has been seen in the London district.

"Some Load."

On a recent Sunday, what is said to be the largest metal casting ever produced in the world, was conveyed from South Shields to Newcastle-on-Tyne. The weight of the casting was calculated to be 85 to 90 tons, and was the largest item of an order for cast-iron blocks, which include two 60 tons, one 71 tons and the casting mentioned above, the two 60-tonners having been previously conveyed on North Eastern Railway 60-ton flat wagons. The wagon resources of the North Eastern Railway were taxed to find a means of conveying the load, both on account of the weight of the casting and siding accommodation where the loading and unloading had to take place.

Three North Eastern Railway 40-ton flat wagons were selected to carry the load, which rested on the centre wagon, and by means of timber and steel beams well braced together, a portion of the weight was transferred from the centre wagon to each of the two outside carrying wagons. Two additional 20-ton trollies were required to complete the arrangement, one at each end, and acted as runner wagons for the ends of the levers, from which balance weights were suspended. The arrangement proved entirely satisfactory, and as the journey was not a very long one an average speed of 5 miles per hour was easily made.

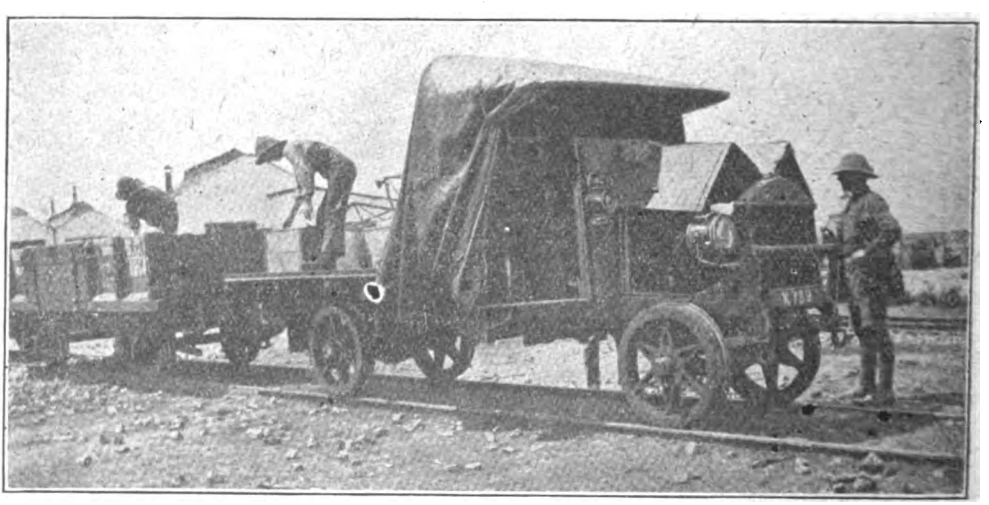
The Railway Club.

In spite of so many of its members being absent serving in His Majesty's Forces, or otherwise engaged in war-work, this society continues to "carry on," at 92, Victoria Street, London, S.W. The annual general meeting is to be held on the second Tuesday evening in the New Year, and Railway Magazine readers desirous of joining the club should write to the hon. secretary, enclosing a stamped and addressed envelope for his reply. Non-members are likewise invited to visit the club on the occasion of its monthly meeting nights. The club, which is open daily for the use of members, owns a valuable railway reference library.

On Tuesday evening, November 13th, a number of members witnessed a lantern display of club-owned slides of locomotive and train pictures, supplemented by some excellent contributions loaned by Mr. Bell, of the Locomotive Publishing Co., Ltd., Mr. Sherlock, the club's treasurer, and Mr. E. J. Miller, hon. secretary. Mr. W. Parker presided, and the pictures were explained by Messrs. Hopwood and Cosgrave in a very satisfactory manner. It is expected that a further exhibition will be given at the monthly meeting, 7 p.m., Tuesday, December 11th.

A Lorry Locomotive.

From East Africa a correspondent writes:—"I send you a print of one of a Napier 30 cwt. lorries taken before the advent of the railway engine, since our occupation of the Central Railway in East Africa. These lorries, with several others, were tried on the rails, and I must say that they proved worthy of the name which they have earned for themselves. From what I have seen of lorries in this country, I think the 30 cwt. Napier has surely done its bit, and has always been most reliable. The so-called roads are mostly thick sand, with an occasional dry river bed crossing the road, so it will give you some idea of what a fearful test the lorries



A NAPIER 30 CWT. LORRY, FLANGED WHEELS, AS IN USE IN GERMAN EAST AFRICA.

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are put to. I cannot but give high praise for all they have done."

Cheap Travel in Burma.

ACCORDING to a writer in Burma, in the early railway days in that country it was found that many hundreds, if not thousands, of tickets were issued from a small station near Rangoon, which did a very small trade. It was calculated that if all the inhabitants of the place passed their whole lives in trains, they would not want so many tickets as this station issued. The fare to Rangoon was only a few pence, and very few tickets were issued from Rangoon. The exodus was all one way. Eventually it was discovered that people from a distant station had been travelling without tickets the greater part of their journeys, and had these cheap tickets handed to them before arrival to deliver up in Rangoon, making two or three rupees profit on the transaction. Such doings could not take place now, where there are travelling ticket examiners on trains, but at the start the railway management had a good deal to learn, and Burmese who would have disdained to steal fowls, thought there was nothing very wrong in taking advantage of a railway company's ignorance, and making money at its expense.

Great Western Railway Engines.

A VERY popular book was published a few years ago giving an historical survey of the production of Successive Types of Great Western Railway Engines for nearly half a century. The book having been sold out, a new edition was put in hand, and after considerable difficulty and delay owing to war-time restrictions, it is at last on sale. The price is 1s., or through the post from the RAILWAY MAGAZINE office, 1s. 1d. The book gives particulars of names, numbers, types and classes with illustrations and descriptions. It is much enlarged from the original work, includes more illustrations, and its records have been brought right down to date. Former editions were sold at 6d. per copy, but owing to the great increase in cost of production by reason of the prevalence of war prices, coupled with the increased size of the book, it has become necessary to publish the new edition at one shilling.

Railway Restrictions.

THAT the public are expected to refrain from travelling at Christmas and New Year this winter has been broadly advertised by the daily newspapers. The breaking-up time of schools for the Christmas holidays is likewise to be altered in order that the railways may not be congested with juvenile travellers at the usual busy period; for happen what may, extra work at Yuletide is invariably the lot of the railway man engaged in the traffic department. The stern necessity for such restrictions and also for the increase in fares is far from understandable by the great bulk of the people, and it is necessary, on the part of the Government, to emphasise the reasons, again and again.

Mr. Wardle, M.P., Parliamentary Secretary to the Board of Trade, lately received recently a small deputation, introduced by Mr. Jacobsen, M.P., from the United Kingdom Commercial Travellers' Association, who desired to urge on the Board of Trade that commercial travellers should be relieved of the present increases in railway fares. Mr. Wardle pointed out that the difficulties under which the British railway companies are labouring are much more severe than they were at the beginning of the year. Many more than 500 locomotives had been sent abroad for the purposes of the war, and some thousands of locomotives are awaiting repairs, which cannot be undertaken owing to shortage of materials and labour, while over 160,000 men have been released by the railway companies for military service. Although the train services have been seriously reduced, a greatly increased traffic has to be dealt with by the railway companies. In these circumstances, the Board of Trade desire again to urge upon the public the absolute necessity of reducing to the utmost possible extent calls upon the railway companies involved by the conveyance of passengers and goods. The Government would be most reluctant to place any further restrictions on travelling by railway, but the ever-increasing demands on the railways may make such a step necessary, unless the public willingly refrain from using the railways except in cases of absolute necessity.

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WHAT THE RAILWAYS ARE DOING

For the year 1918 Mr. J. Coghlan, General Manager, Dublin and South Eastern Railway, has been elected Chairman of the Railway Managers' Conference at the Irish Railway Clearing House. Mr. Coghlan commenced his railway career in 1870 in the Irish Railway Clearing House, under the Secretaryship of Mr. Elevin (who was the first Secretary of the House). He joined the Dublin, Wicklow and Wexford Railway, in 1876, and served in the Audit Office, being appointed Chief Accountant in 1892, Traffic Manager in 1897, and General Manager, 1917.

* * *

At the age of seventy-eight the death has taken place of Mr. Q. Y. Lawson. Before his retirement from active railway life Mr. Lawson, as agent in chief for Scotland of the East Coast Companies, was well known from John o'Groats to Carlisle. He likewise had many friends at York, King's Cross and at the fishing ports of Great Yarmouth and Lowestoft. Mr. Lawson was an Ayrshire man. As a lad, he entered the service of the Glasgow and South Western Railway in his native county, and, possessing marked business ability, his promotion was steady, till in the end he was appointed manager of the City Union Railway, then associated with the Glasgow and South Western Railway. He occupied that position till this railway was absorbed by the North British Railway and was then appointed the agent of the East Coast Joint Railways in Glasgow and the West of Scotland. He held that position till he was retired on pension under the age limit. His portrait appears on this page.

THE LATE MR. Q. Y. LAWSON.

Mr. Thomas Jackson, the Goods Manager of the Furness Railway, has been appointed Dock Superintendent, in conjunction with his present position, and he will have charge of the work in connection with the loading and discharging of all vessels at the Barrow Docks. It has been found necessary to make this appointment in consequence of the very large tonnage which is now being dealt with at the Barrow Docks, particularly in regard to imported iron ore. Mr. Jackson is now known officially as "Goods Manager and Dock Superintendent."

* * *

Recent obituary includes Mr. E. H. Turner, the highly respected Superintendent of Nine Elms Goods station, London and South Western Railway, who, after apparently recovering from an indisposition which had occasioned his absence for some weeks, unexpectedly passed away at the age of 57. Mr. Turner entered the London and South Western Railway service in 1875 and was attached to the Goods Department at Salisbury. In 1895 he was made Goods Agent at Reading, which position in 1912 developed into that of Superintendent for the surrounding district, including Bracknell, Aldershot, Guildford, and Basingstoke. After 20 years at Reading he was, in 1915, appointed at Nine Elms, the largest goods station in the United Kingdom, where during three years of war-time his experience in goods transport has been of great value. Capable and energetic, and of a happy and kindly disposition, the Company by his decease lose a valued officer and the Nine Elms staff a popular chief.

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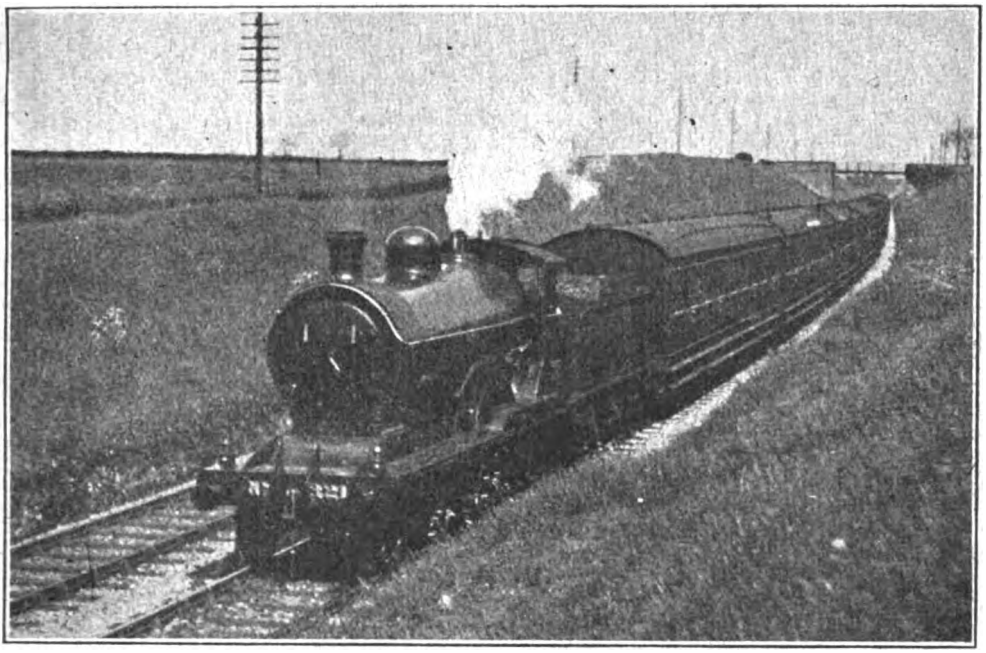

Photo] [*Herbert H. Coglan.*

GREAT SOUTHERN AND WESTERN RAILWAY.

3 p.m. Dublin-Cork express train near Clondalkin, engine No. 321.

MR. JOHN DUNSTER, who, at the end of September last, gave up his position as London Divisional Superintendent of the Great Western Railway, and retired from the service after forty-six years of activity, has been the happy recipient at the King's hands of a handsome diamond pin surmounted by the Royal monogram, as a mark of Royal favour, Mr. Dunster having been well known to His Majesty in connection with his frequent journeys over the Great Western Railway. An additional mark of favour was conferred upon Mr. Dunster recently at Reading, when the staff—both salaried and wages—of his old division made him a joint presentation of a magnificent canteen of silver in a fumed oak case bearing an engraved inscription, together with a travelling bag, as a token of their respect and esteem for him and their appreciation of the generous manner in which they had been treated whilst he had charge of the London division. Mr. Dunster's portrait appeared in the last October RAILWAY MAGAZINE.

* * *

MR. WM. MACLEOD, who was recently appointed by the Government to organise the railway work of the Board of Trade, Timber Control, has been temporarily appointed Transport Officer for Scotland. Previous to taking up Government work Mr. MacLeod was General Inspector on the Highland Railway, having been appointed to that position only two years ago, after a short but successful term in a similar capacity at Perth. Mr. MacLeod's headquarters are in Edinburgh.

THE Board of Trade have recently confirmed the undermentioned Order made by the Light Railway Commissioners :—Newport Light Railway Order 1917 authorising the construction of a Light Railway in the County Borough of Newport in the County of Monmouth.

* * *

WORKING on the South Eastern and Chatham Railway's Reading branch are the following types of Great Western Railway engines :—0–6–0, 2–6–0, and 4–4–0 locomotives of both the "Flower" and "Earl of Devon" classes. I recently saw, writes Mr. R. S. Warner, an engine of the latter class, No. 3255 *Excalibur*, piloting South Eastern and Chatham Railway's 0–6–0 locomotive No. 693 on a goods train of 12 wagons.

* * *

A NUMBER of the Barry Railway 0–6–0 saddle tank locomotives are being used by the Great Western Railway.

* * *

REFERRING to the list of the stations of London and North Western Railway four-cylinder "Claughton" locomotives on page 264 of the October RAILWAY MAGAZINE, Mr. C. Williams states No. 162 is now stationed at Crewe and No. 2366 is at Preston. Nos. 2431, 2445 and 2450 are now in service, and are stationed at Crewe. Of the new series referred to on the same page, Nos. 116, 159 and 171 have been turned out, and are stationed at Crewe. The remaining seven engines, which are expected in service shortly, will bear Nos. 986, 1085, 1103, 2122,

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2368, 2416 and 2426. Like the preceding 17 new engines, the batch referred to is being turned out without names. The summary of stations of "Claughton" class locomotives is as follows :—Crewe, 31 ; Rugby, 7 ; Camden, 5 ; Carlisle, 5 ; Edge Hill, 3 ; Preston, 2 ; not in service, 7 ; total, 60 engines. One of the Edge Hill engines, No. 1327 *Alfred Fletcher*, has been fitted for indicating purposes and is, for the time being, stationed at Crewe.

* * *

THE following engines, writes Mr. Williams, have been superheater fitted at Crewe this year : "Precursor" class, Nos. 300 *Emerald*, 302 *Greyhound*, 323 *Argus*, and 1309 *Shamrock* ; four-cylinder compound mineral engines rebuilt as two-cylinder simples, Nos. 500, 1448, 1884 and 1885. There are now 47 4–6–2 passenger tank engines, all superheater fitted, in London and North Western Railway service. Of these 12 were constructed originally without superheaters.

* * *

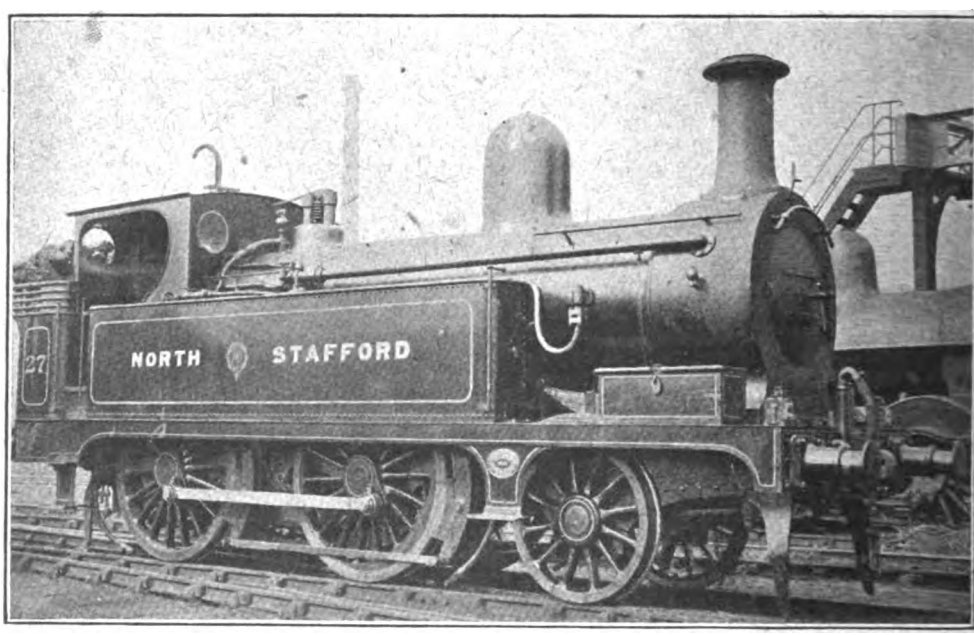
FOLLOWING Mr. G. N. Peel's remarks in the October RAILWAY MAGAZINE concerning 4–6–0 locomotives on North Eastern Railway express trains, Mr. J. G. Pearson writes :—"The 7.8 p.m. Newcastle–York mail, which I often travel by, is now invariably hauled by a three-cylinder 4–4–2 of Class Z and on the few occasions the same are not employed a 4–4–2 of Class V or 4–4–0 of Class R takes its place. I have not seen a 4–6–0 on this train for a few years, although about a year ago I travelled by 4–6–0 No. 825 with 'Stumpf' cylinders on the relief portion of this train (it is run in two portions daily), the first portion leaving Newcastle at 7 p.m. I might add that this relief is generally hauled by a 4–4–2 of Class Z. The 4–6–0's, although they do work on expresses, the trains are mainly of a semi-fast character and they now seldom, if ever, haul the through East Coast and Leeds–Glasgow expresses, in fact they rarely work the Newcastle–Liverpool cross country expresses *vid* Stockton, Harrogate and Leeds, let alone the main line, these London and North Western trains being generally hauled by 4–4–2's of Class Z. For the last five or six years the 4–6–0's have taken very little share in hauling the East Coast trains ; if a 4–4–2 was not available generally a 4–4–0 of Class R or Ri was used. Of course now nearly all types of North Eastern Railway engines are used on goods trains, including all classes of 4–4–2's and 4–4–0's, the 4–6–0 are mainly allotted to this work, although, as I have said before, they take a share in the passenger traffic of a secondary nature. Last year I noticed the two 4–4–2 four-cylindered compounds at Heaton Shed, as well as the 4–6–0 No. 825."

* * *

IN response to the question asked by a reader as to what the London and North Western Railway locomotive, *Thunderer*, is doing, Mr. J. Turnock writes to say he recently saw it working a return empty Red Cross train from Manchester. It was passing through Macclesfield *vid* the North Staffordshire line.

* * *

IN a lecture at the London School of Economics Mr. Philip Burtt, formerly deputy-general, North Eastern Railway, remarked how



Photo] [*P. F. Cooke.*

NORTH STAFFORDSHIRE RAILWAY.

2–4–0 tank engine, No. 27, at London Road station, Manchester.

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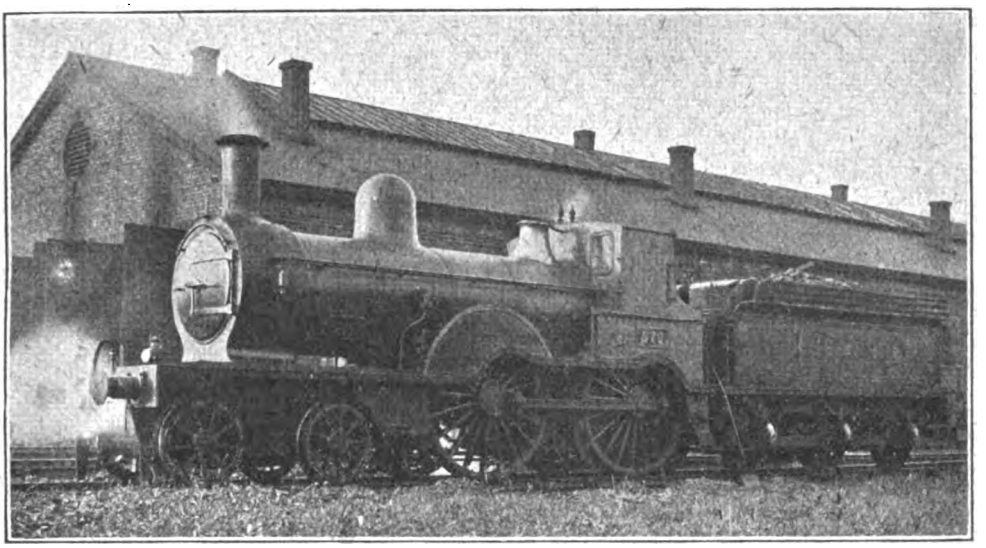

Photo] [*P. F. Cooke.*

NORTH EASTERN RAILWAY.

4-4-0 "Tennant" engine, No. 576, at Bridlington.

interesting it is to speculate on the extent to which railway speed may yet be developed. He directed attention to the fact that in the north of England there is an illustration of the development of electricity in its application to railway trains. The North Eastern Railway have lately on the very line of track on which Stephenson ran his first locomotive in 1825, converted their mineral haulage from steam to electric, and have deliberately applied electric traction to the heaviest trains they can find on the line, loads of a thousand tons. No one knows the limit of load of the electric engine. It has to be kept to the working time-table because of brake power, etc., but everyone is wondering what load this engine could take if it were allowed enough scope. In 1904 or 1905, in Germany, an electric train near Berlin went at 130 miles an hour. It is hardly probable future generations will be content with railway speeds averaging about 50 miles an hour when we reflect that a Russian engineer, prior to the war, seriously claimed it to be within the realm of the practical to take passengers from Petrograd to Moscow—600 miles—in three hours.

* * *

A CORRESPONDENT recalls that some years ago a hansom cabby was hailed at Grosvenor Road, Pimlico, and was told to drive to the Canterbury Music Hall in Westminster Bridge Road. The "fare" promised the cabby £5 if he would do the trip without passing under a railway bridge. Cabby got his £5, though the route was a circuitous one, as will be found, remarks the writer, by those who have the curiosity and leisure to trace out the route.

* * *

THE Directors of the North British Railway have agreed to improvement in the arrangement at present in operation in connection with the supply of uniform to their stationmasters: (1) The supply of second-class uniform to stationmasters will be discontinued, and those presently supplied with such uniform will be granted first-class uniform; (2) the third-class uniform supplied to stationmasters will be slightly improved; and (3) black bone buttons will be supplied in lieu of gilt buttons on all stationmasters' uniforms. The new arrangement referred to will take effect when the next issue of clothing to stationmasters is being made.

* * *

BEFORE going to the Continent, the North Eastern Railway Red Cross ambulance train, recently completed by that company at their carriage and wagon works, York, went on a tour for inspection at several towns on the North Eastern Railway system. Before commencing the tour, the new train was inspected at York station, those present including the General Manager, Sir A. Kaye Butterworth; Mr. A. C. Stamer, Acting Chief Mechanical Engineer; Mr. J. H. Smeddle, Assistant Divisional Locomotive Superintendent; Major H. A. Watson, General Superintendent; Mr. J. B. Harper, Assistant General Superintendent; Mr. R. Pick, Manager, Carriage and Wagon Works; and Mr. F. J. Thurgood, Passenger Manager's Office.

* * *

AT Derby Carriage and Wagon Works the Midland Railway has just completed another new ambulance train for service with the British forces overseas. The train (No. 40) is specially designed for service in hot climates, being provided with a double roof, insulated against heat by an asbestos mattress, with an air chamber between the two roofs. Each carriage is mosquito-proof, the windows throughout the

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train being double—one of the usual plate glass, the second consisting of a louvred frame covered on the inside with brass wire gauze. Each window can be manipulated independently as climatic conditions require. The complete train consists of 16 cars, each 54 ft. long. The total length of the train without engine and tender is 913 ft., and the weight (unloaded) 430 tons. It was arranged for the train to be on exhibition at Bradford on Sunday and Monday, November 25th and 26th. The arrangements included an admission charge of 1s., and an illustrated booklet giving details of the train to be sold at 6d. The whole of the money collected is to be devoted to providing comforts for the railwaymen with the armies abroad, to assisting the funds of the Red Cross Society, etc.

* * *

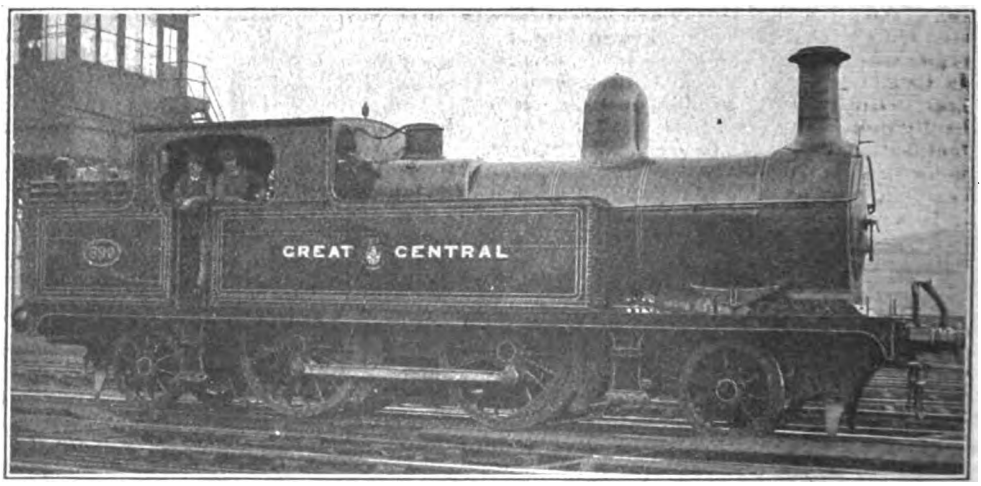
THE Lancashire and Yorkshire Railway has just completed at Newton Heath Works another ambulance train for use on the Continent. The train includes the latest devices for the expeditious and easy movement of soldiers from the firing line, and is in every way splendidly equipped for the purpose. Bearing in mind the interest taken by the public when, in January, 1916, a previous train was exhibited, the company placed it on view at Southport and at Liverpool (Exchange), etc. By means of such exhibitions thousands of pounds have been handed over to the various charitable institutions.

* * *

IN New South Wales there has been recently adopted a new type of Red Cross carriage, which is highly appreciated by wounded soldiers. The cars are of the American type used on suburban trains, and were specially fitted up under the direction of Lieut.-Col. Lucy, chief railway mechanical engineer, and Mr. Hill, chief draughtsman. The seats have been removed, and two rows of berths fitted in each side of the car, upper and lower, providing sleeping accommodation for twenty-two patients in each car. Vestibule connection is provided throughout the train, and it is possible for the doctors and nurses to patrol in any weather from one end of the train to the other. In the middle of the car provision is made for boiling water, making soup, etc., on a gas range provided with gas from the same cylinder that lights the vehicle. The berths are of the same type as those used on board a popular mail steamer, and fold up against the side of the car during the daytime. The lower ones are converted into long seats or couches by a pin and hook, and special cushion arrangements. The cars have made several trips to the border, and have given satisfaction in every way. It is claimed that they are equal to anything of the kind used in Europe.

* * *

THOSE who look forward to the day when there will be railway communication between France and England will approve of the action of Mr. Arthur Fell, the Chairman of the Committee of the House of Commons formed to urge the construction of the Channel Tunnel, in publishing a pamphlet protesting against the decision of the Government, acting on the advice of the War Office and the Admiralty, not to proceed further in the matter during the continuance of the war. Mr. Fell says that the peace and happiness of Western Europe now depend on the permanent friendship of France and England, of which the tunnel would be the outward symbol, and argues that the decision of the War Office shows that the Department fears that a stable peace will not be secured. While he and his committee cannot admit such a possibility, they urge that the present war has demonstrated the necessity for the tunnel.



Photo] [*P. F. Cooke.*

GREAT CENTRAL RAILWAY.

2-4-2 rebuilt Belpaire side tank locomotive.

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A NORTH Country correspondent directs attention to the fact that desirable developments may result from the experiment of the Great Central Railway with a distinctive night-light for the "distant" signal. Most railway travellers are familiar with the fish-tail cut which differentiates the arm of the "distant" signal in the daytime, but it is a singular anomaly on British steam-worked railways that no unerring identity has been adopted for the hours of darkness. Except in a few isolated cases, the colour changes on all lines are the same for "distant" and "home" signals—namely, red and green—and yet, in the case of the "distant," red does not necessitate an immediate stop. Obviously, in these circumstances, drivers must possess a perfect knowledge of the road, as indeed they should, but it is hardly in accordance with the usually well-managed devices which obtain on British railways to counteract all possible contingencies arising from a failure of the "human element" that the night signals should be so liable to be misread. In America the danger was ultimately surmounted by the adoption of yellow for the "distant" signal "on" light, and the Great Central Railway's experiment with this colour for the same purpose will quite possibly lead to a more extensive use in this country.

* * *

PRIZES have been awarded for the best-kept station gardens on the London and South Western and Midland Railway Somerset and Dorset Joint Line in the following order: Midsomer Norton, Midford, Bailey Gate, Pylle, Masbury, Shillingstone, Evercreech New, Cole, and Wells.

* * *

A PERTINENT PARAGRAPH including a letter concerning early 4-4-0 engines from Mr. J. P. Brierley published in the November RAILWAY MAGAZINE has elicited several communications from readers on the same subject. Mr. L. B. Hewitt, writing from Bath to correct Mr. Brierley's statement that the "Duke of Cornwall" type of 1895 was the first Great Western Railway 4-4-0 class built, claims that the first narrow gauge Great Western 4-4-0 engines were the four "Armstrong" class locomotives, built by Mr. William Dean in 1894. "These engines," he remarks, "were numbered 7, 8, 14 and 16, and named respectively *Armstrong, Gooch, Charles Saunders* and *Brunel*. The last-named engine was recently re-numbered 4169. Nos. 14 and 16 were stated to incorporate portions of earlier 'convertible' engines." Mr. Hewitt himself, however, is open to correction, seeing that, as Mr. Cecil J. Allen reminds us, the engines cited were not *built* by Mr. Dean in 1894, but *re-built*, having been originally constructed as 2-4-0 engines for the broad gauge at dates between 1886 and 1888, and designed specially with a view to subsequent conversion.

* * *

FROM Mr. F. M. Mann and Mr. E. J. Dorey have come communications concerning the earliest 4-4-0 engines on the London and South Western Railway, which they correctly attribute to Mr. Joseph Beattie. There were 20 engines in this class—Nos. 348 to 367—with 6 ft. 6 in. driving wheels and 18 in. by 26 in. cylinders. The first of these engines was turned out in 1866, and the remainder in 1877, one of their curious distinctive features being the long straight-stopped square-ended splasher over both pairs of coupled wheels. Mr. Mann further remarks in his letter, "In 1879 Mr. Adams introduced bogie engines built by Messrs. Beyer Peacock and Co., and some of these I saw as recently as 1911, which would make 32 years' service. They had solid bogie wheels, outside cylinders, and driving wheels about 6 ft. diameter."

* * *

As regards the London, Brighton and South Coast Railway, Mr. Hewitt and Mr. Dorey are in agreement to the effect that the pioneer Brighton 4-4-0 was Mr. R. J. Billinton's No. 314, *Charles C. Macrae*, built in June, 1895; this name has now, of course, been transferred to No. 327, the first of the large 4-6-4 tanks. Concerning the Great Eastern Railway, which none of the writers appear to credit with any 4-4-0 engines prior to the "Claud Hamiltons" of 1900, we are indebted to Mr. Cecil J. Allen for information to the effect that the last-mentioned engines were preceded 26 years earlier by the famous 4-4-0's turned out by Mr. Samuel Johnson in 1874, with 17 in. by 24 in. cylinders and 6 ft. 6 in. driving wheels. Other 4-4-0 2-cylinder compound engines—11 in number—were built for the Great Eastern Railway by Mr. William Worsdell during the period of his superintendence. "Some further very early 4-4-0 engines which did not figure in Mr. Brierley's list," Mr. Allen adds, "were the six outside-cylinder 4-4-0's supplied by Messrs. Neilson and Co. to the Great North of Scotland Railway in 1876. They were designed by Mr. William Cowan, then Locomotive Superintendent, and had 16 in. by 24 in. cylinders and 5 ft. 6 in. coupled wheels, being primarily intended for goods traffic. About 1901 Mr. Pickersgill rebuilt them with larger boilers and 17 in. cylinders, and I believe that some of the type, known as Class L, are still at work."

* * *

OUR valued west country correspondent, Mr. T. R. Perkins, writes from Henley-in-Arden: "I recently cycled past Spetchley station, on the old Midland main line to Bristol: as you know, there are three disused stations—Droitwich Road, Dinxhampstead, Spetchley—on the Stoke Works-Abbott's Wood section, all disused for passenger traffic since over 60 years ago. Only goods and express trains take that route now, and as Spetchley was once the station for the City of Worcester (4 miles away), and called 'handsome and convenient,' I wanted to see it. What is left is *very* scrubby, and the approach road closed and grass-grown: the station master's house still exists, but no platforms remain. If the shabby little hut—something like an old tollgate-house—that remains was the whole of the station building, I am afraid my

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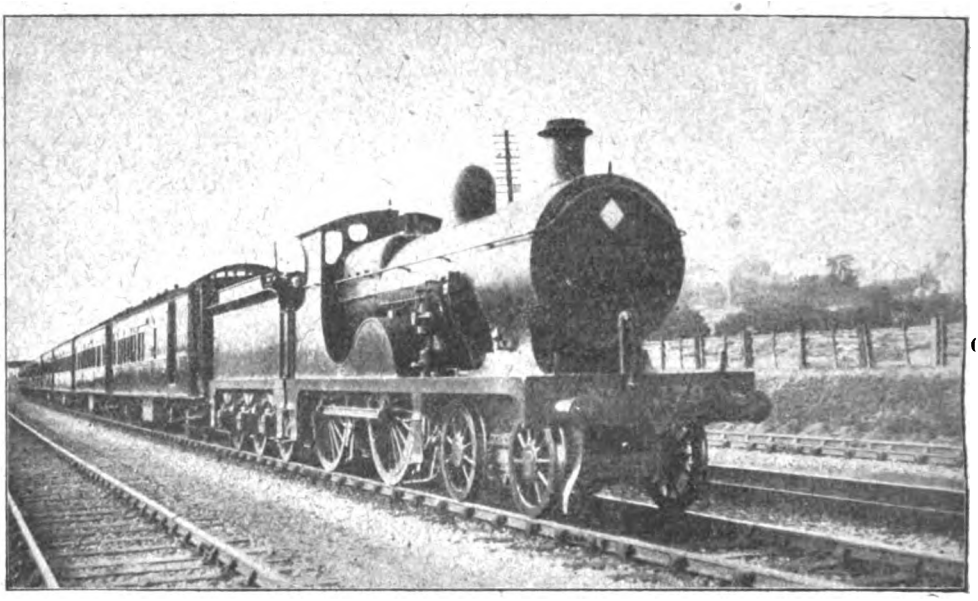

Photo] [*W. H. C. Kelland.*

SOUTH EASTERN AND CHATHAM RAILWAY.
Folkestone train near Grove Park. 4–4–0 engine No. 179.

ideas of a suitable station to serve the city of Worcester are not those of the architect of 1839!"

* * *

"Evidently," continues Mr. Perkins, "our Lapworth branch is not to be reopened: not only is permanent way removed, but girders of bridges are also gone; and lately the junction here has been taken out and a siding junction substituted, together with removal of all signals relating to the branch."

* * *

MR. A. ALCOCK, railway superintendent of the Manchester Ship Canal, has been appointed chief assistant to the dock traffic superintendent, Mr. George Hazlehurst. In order that there may be closer co-operation in working the general dock traffic and the railway traffic at the Manchester Docks, Mr. George Hazlehurst has been appointed in control of both these classes of work, and Mr. Alcock will act as chief assistant in the future. Mr. Harry H. Hamilton will act as chief assistant to Mr. Hazlehurst and Mr. Alcock. Correspondence should continue to be addressed directly to the dock traffic superintendent's office and to the dock railway office respectively.

* * *

MR. EDWARD COATES, of Derby, who has just celebrated his golden wedding, started his business career in the employ of the Midland Railway, and at the early age of nineteen was stationmaster at Haworth, near Keighley. He was then promoted to Ingleton, between Leeds and Carlisle, on the old route. Ingleton at that time was a much more important station than it is to-day, for it was the northern terminus of the Midland Railway, and all Scottish traffic had there to be handed over to other lines. In 1870 he severed his connection with the Midland Railway and entered the service of Messrs. Benton and Woodiwiss, the once famous railway contractors, who were just commencing the construction of the Settle and Carlisle section.

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